The Builder.

No. CCXLI.

SATURDAY, SEPTEMBER 18, 1847.

IN April, 1844, ten commissioners were appointed by Government to inquire into the most eligible situation for a harbour of refuge in the channel,* and in the month of August in the same year, they reported in favour of Dover. In the following year the constitution of the commission was slightly altered,† and they took further into consideration, amongst other important points, the mode of constructing the proposed harbour, and the materials to be used. The commissioners examined many witnesses, and at the commencement of 1846, recommended, in respect of the points we have named, that the inclosure of the proposed harbour should be formed by *a wall nearly upright*, and said masses of brick in cement might be used for it below low-water mark, with granite or hard stone above. The following are the words of the report:—

"Practical illustrations, together with the weight of evidence bearing on the subject, lead us to an unhesitating recommendation of a wall nearly upright, to form the inclosure of the harbour proposed to be constructed in Dover Bay.

With respect to the description of material to be employed, we have had to consider the very serious difficulties arising out of the want of stone of a suitable quality in the neighbourhood of Dover. If granite could be procured of the required dimensions in sufficient quantity, and with ordinary facility, it would undoubtedly be the proper material to use.

Portland and the Channel Islands have been pointed out as the places from whence supplies of stone may be obtained; but both are at a considerable distance from Dover; and the delay that might occur in the supply will be obvious. Several of the engineers have in consequence recommended concrete in blocks, or masses of hard brick in cement, as substitutes for stone; the former on the supposition of its cheapness.

We think, however, there is not sufficient experience of the use of concrete, to warrant its adoption for the faces of works to be constructed in the sea.

We are of opinion that, if stone cannot be readily procured, masses of brick of a proper quality, laid in cement, may be used for all purposes below low-water mark, with perfect confidence in the strength and durability of this material; but that above water, granite or hard stone will be necessary.

We do not enter into any detailed specification of the plan and dimensions of the piers, which will be the duty of the engineer who may be employed. Their breadth will have to be determined by the space required for quays, coaling stations, and for general mercantile convenience. We consider that the interior or hearting may be composed of rubble and concrete; and we would strongly recommend that the work be commenced at as many points as practicable, at the same time."

Two of the commissioners, Sir Howard Douglas and Sir William Symonds, refused to sign this report; the first on the grounds, amongst others, that he considered the building of an *upright* wall in the open sea, in seven or eight fathoms water, was a proposition novel in theory and not proved in practice, on any scale to warrant its adoption, and was decidedly opposed "to the employment of any artificial or inferior material, as a substitute for stone, from mere considerations of pecuniary economy;" these, he thought, should have no place in a great national undertaking, "which, if not to be constructed on sound and well-tried principles, with materials of the best and most enduring descriptions, should not be attempted." He was of opinion, that a breakwater of the proposed elevation and magnitude, rising, with an upright face, from the depth of 42 feet at low water, would be far less capable of resisting the violence of seas than a sloping breakwater, formed in a manner similar to that which has been completed in Plymouth Sound.* The second objector concurred in both these grounds of dissent, and, further, was opposed to Dover as the site of the harbour.

This large work, if carried out, would involve the expenditure of some millions of money, and the efficient execution of it is necessarily a matter of great moment. It is not our present purpose, however, to discuss the soundness of the recommendations contained in the report. The reasons of the dissentients have been printed, by order of the House of Commons, and the matter must of course receive further and most serious consideration. The question of building an upright wall in lieu of a sloping breakwater, must be discussed more profoundly and severely than has yet been done, before the work be attempted.

Throughout the evidence are scattered opinions and information on the subject of concrete and other materials used in construction, and our present object is, simply to abstract these for the benefit of our readers. We take the evidence in the order in which it stands, accompanying the report of January, 1846.

Capt. Denison, R.E., the first witness, in reply to the inquiry—"In the letter written by Colonel Jones and yourself to the Admiralty, you allude to the experience of other nations in the use of concrete for centuries. What are the particular works which afford this length of experience?"—said,—"In answer to that question, I think I had better refer the commissioners to the prize essay by Mr. Godwin, upon the nature and properties of concrete, and its application to construction up to the present time, which was published in the Transactions of the Institute of British Architects. In this work many instances are recorded where concrete was used by the ancients: Vitruvius is quoted, and a variety of others, who have written upon the subject, all of whom testify strongly in favour of this material.

Can you briefly mention the places, and what the works were?—At Richborough Castle, in Kent, many of the walls, which are of Roman workmanship, are filled in with concrete. The foundations of Salisbury Cathedral are laid in concrete; that of the north transept of Westminster Abbey the same; and the walls of some of the fortresses in Spain bear strong evidence to the solidity which a mass of concrete can attain in time; they were found more difficult to breach than walls built of stone, and may be said to have required to be pounded to pieces. Belidor, in his Architecture Hydraulique, strongly recommends this material for foundations."

"Do you know any instance of masses of brickwork, with cement, being used for submarine works in exposed situations?—No, I do not know an instance; but I do not see that there can be any difficulty in constructing them.

And, in fact, you consider them as substantial and as good for the purpose as concrete, except the expense?—Yes: the difference in the cost is my only reason for preferring concrete to brickwork.

(*Sir William Symonds.*)—What is the specific gravity?—The specific gravity is rather less. Concrete weighs about 140 lbs. to the cubic foot, and brickwork about 110.

What is granite and Portland stone?—Granite weighs from 160 to 170; Portland stone about 150 lbs. to the cube foot."

(*Sir Howard Douglas.*)—"You propose to build a perfectly upright wall from the bottom?—Yes.

With concrete *blocks* up to low-water mark?—Yes.

And you have no doubt that concrete will resist the action of the water below, and that it will not be undermined nor worn away by the shingle which would roll along the foot of the wall?—There is no rolling with a vertical wall.

You have no doubt that it would not be undermined by the action of the current, but that it would stand; and you would bring up the concrete wall to low-water mark?—Yes; and above that I would build it with granite.

You have no doubt of the power of concrete to bear that immense superincumbent weight?—I have no doubt, both from my own experience and the experience of others.

You are prepared, as an engineer, to recommend this use of concrete?—I am.

What are the ingredients?—I think the best material we can have is the gravel with sea beach, if it contains a sufficient quantity of sand; this should be mixed with the best hydraulic lime we can get, in the proportion of ten or twelve of gravel to one of lime; and with the view of causing it to set more speedily under water, a proportion of puzzolana should be added, varying in quantity according to its quality; half the quantity of puzzolana that there is of lime will make very hard sound concrete, which will set rapidly; and in cases where it is desirable that it should set very quick, the quantity may be increased till it equals that of the lime.

Those are pretty nearly the proportions of the ingredients that have been used for some time?—Pretty near; there is an increase in the shingle; there is less lime in proportion to the shingle, and a proportion of puzzolana is added."

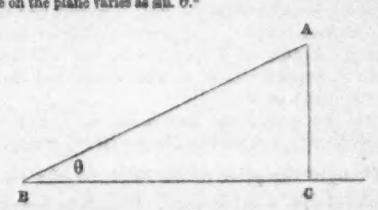
The concrete wall at Woolwich had bearing piles, "because the foundation was mud and peat. The sheet piles were 10 feet apart, and were connected from distance to distance by iron ties. Concrete was then thrown in on the soft mud; it was thrown in *en masse*, till it came up to the level of the wall, and upon that foundation the blocks of concrete were built, and concrete again filled in in the rear of them. That wall is now quite hard. The foundation part, which was thrown into the water, is quite hard. I had occasion, three or four years ago, to cut into it, and I found it quite hard. I have built a large chimney, 210 feet high, at Woolwich. The weight on the foundation is at least 3,000 tons; the foundation is a stratum of concrete upon chalk, and the weight is fully three tons upon the foot superficial."

"With reference to this wall (Woolwich), I did doubt its durability; I thought it was soluble in water, that the constant action of the water would act chemically on the mass, and wear it away.

* Admiral Sir Byam Martin, Chairman, Lieutenant-General Sir Howard Douglas, Bart., Rear-Admiral Deans Dundas, Sir J. H. Pelly, Bart., Captain Sir W. Symonds, Captain Washington, Lieutenant-Colonel Colquhoun, Lieutenant-Colonel Alderson, Captain Fisher, and Mr. James Walker.

† Captain Beaufort and Captain Brandreth took the places of Captain Fisher and Mr. Walker.

* "The application of the theory of the resistance and impact of fluids is no doubt attended with great difficulties and anomalies in this, as in many other cases connected with natural philosophy; but whatever results have been derived, either from theory or observation, they all agree in this, that the horizontal impulse of a fluid on any resisting body is increased, in a very high ratio, as the inclination of its surface (AB) to the direction (BC) of the motion increases. The fundamental theorem is, that this varies as (sin. θ)^2 (θ representing the inclination), because the height of the breakwater continuing the same, the quantity of fluid impinging on it will be the same at all inclinations. If the height of the breakwater were variable, the whole impetus would then be as (sin. θ)^3, because in this case, not only is the force of each particle diminished in proportion to (sin. $\angle\theta$)^2, but the number of particles which impinge on the plane varies as sin. θ."



"On the best form for the profile for a "breakwater," a difference of opinion exists; and while, on one hand, it is contended that the exterior face of the wall should be vertical, on the other, a face inclined to the horizon is recommended. The advocates of the former construction seem to consider that such a wall is subject only to the hydrostatical pressure of a fluid at rest, or that the agitations of the water before it, take place only in vertical directions; but neither of these conditions holds good in Dover Bay, or wherever, by the force of winds and currents, the waves are impelled with violence against the shore. That loose stones constituting a breakwater, when deposited so as to form an inclined plane, should be occasionally displaced by the action of waves is sufficiently obvious; but that, with equal quantities of material, a vertical wall should resist the concussions produced by such action, as efficaciously as one with an exterior slope, is inconceivable," says the dissentient.

To ascertain this, I put a block of concrete into distilled water, and on examining the water a week afterwards, I found a trace of lime in it. I then consulted Mr. Faraday, and he said that he thought it probable that there was a little uncombined lime, but that if I would wash it and suspend it in the river six months, he would then try it. I suspended a block in the river at Woolwich six months; I then took it up and let it soak for a week in distilled water, and there was not a single trace of lime in the water, shewing that there is no chemical action of the water upon the hydraulic lime.

(*Sir Howard Douglas.*)—What do you think is the adhesive strength of concrete of the best material compared with that of stone, say York stone or Portland stone?—It depends upon what kind of power you use. As resisting a crushing power, I should think about a third or a fourth."

A concrete of blue lias lime and shingle, thrown into the water at Bridport Pier, without any precaution, "is now in such a state of solidity that it admits of being broken and polished, and it is as hard as any pudding stone, in fact nearly as hard as the flints of which it is composed."

Witness thought concrete would resist a crushing power of, probably, a ton on a square inch. Did not propose to use it where it would be exposed to mechanical action. Proposed to use the blue lias lime from Lyme Regis, being the nearest, cheapest, and, as he thought, the best. Was satisfied that blue lias lime would stand in salt water without the use of puzzolana or cement, but was not yet quite determined as to the most economical proportions. Was disposed to think it would be desirable to keep the blocks a year before they were put into the water.

Mr. W. Cubitt, engineer, being asked by the chairman if he had been in the habit of using concrete, replied:—

"I have done as much in concrete within five miles of Dover as would almost form one face of this breakwater.

What is your opinion of its solidity?—I am of opinion that where you have a concrete very good it will stand a great deal of wear and tear. But I have also another opinion, that in that neighbourhood it is difficult to make concrete which is fit for this purpose without mortar of a peculiar quality. I built a sea-wall between Dover and Folkstone a mile in length, the deepest part of which is 70 feet from the base to the top, and every where in the face of that which was accessible to the sea I lined it with the very hardest brick I could find; and even that will not stand the wear and tear of the sea, for I have known them wear into holes, and then you have to cut out pieces and replace them. Where the sea and shingle have acted upon it, it is like scrubbing it out with a hard scrubbing brush.

Suppose the masses of concrete to be used to within three or four feet of low spring tides, do you think they would last long?—They would, for the upper surface lasts a long time, according to the goodness.

Do you consider that concrete of the best quality would be a suitable foundation for the wall in Dover Bay?—Yes, I should conceive that good concrete would; but I doubt whether you would get it; because I do not think, in the quantities there wanted, it is to be got. In the first place, there is no lime of the quality fit to make concrete for this purpose; for the only lime that is fit is to be had in one place, that is, such lime as is being now used by Mr. Hartley, the engineer, at Liverpool."

This lime came from the Halkin mountains in North Wales.

Mr. J. M. Rendel, engineer, was disposed to recommend brickwork built in large masses with cement, and carried out and put in position. When asked the grounds of his recommendation, said:—

"The experience which I have had is rather from some experimental blocks made at Birkenhead. In a very early stage of our proceedings there last year I caused a number of brick piers to be built at about the level of low water, in order to test the goodness of the different kinds of mortar we were making, and those piers were constructed where every tide washed them. Two months after they had been set I had them knocked to pieces, and it was with the greatest difficulty, the cement being nothing more than good hydraulic lime mortar. They were columns of about 4 feet square and 8 feet in height. Some of those masses remained until about a week ago, when I caused them to be lifted by the upper courses, for which the adhesion of the mortar to the bricks was sufficiently strong, the mass being five to six tons, and quite solid, although, as I said before, they had been built very near low water, and, consequently, from the day they were built they had been exposed to the almost constant action of the sea."

These masses were 4 feet square by 8 feet high, and, taking them at 120 lbs. the cubic foot, weighed about six tons each. When asked what crushing power such masses would bear, said, the commissioners might infer it from the fact, that a chimney at Glasgow, which is 360 feet high, had never shewn the slightest symptoms of crushing at the lower courses, although nothing more than common brickwork. Witness did not believe there was an instance upon record, where a wall had fallen from the *crushing of the bricks*.

He was asked the difference in weight between brick and concrete, and replied:—

"The heaviest concrete I have ever had an opportunity of weighing was about 138 lbs. to the cubic foot; now ordinary brickwork in cement will be about 120 lbs.

What is Portland stone?—About 140. Good concrete is about the weight of Portland stone; but then it requires the concrete to be very well made; and I doubt whether you could accomplish that weight in very large masses of concrete.

(*Captain Beaufort.*)—What is the weight of granite?—164, and limestone about 170, and Bath stone is about 132; but you may press bricks in making them, so that the masses of brickwork will be actually heavier than granite.

(*Captain Brandreth.*)—Would the expense be much increased by that?—I think the expense would be increased; it would be about 2s. or 3s. a thousand more the moulding.

(*Captain Washington.*)—Would you make those bricks by machinery?—No; I do not like machine-made bricks. We are making at Birkenhead now more than 60,000,000, and I find that good hand-made bricks, thoroughly well made, are better than those made by machinery."

As to concrete, witness said until he saw chimneys built of concrete as high as our brick chimneys, should have a preference for brickwork. "I cannot bring myself, as a practical man, to the opinion that masses of concrete can ever be made as sound as masses of brick-work; and for this reason, if I build a mass of brickwork, I can depend upon every part of it being equally sound; but I know no plan by which large masses of concrete materials can be so thoroughly coated with lime, as to obtain the same certain results."

"You would not recommend blocks of concrete as a substitute for stone for facing or building breakwaters?—No, I would not take the responsibility. I approve highly of its use in many kinds of foundations, but not when made in separate blocks, and employed in the construction of walls."

Said he would not use it in blocks for the foundation, even, of the Dover Breakwater.

Thought the price of the brick blocks would be about 27s. a cubic yard. Concrete for such a purpose must not have less than one-sixth of ground lime in its composition. Thought no lime so good for the purpose as the ordinary blue lias, which hardens earlier than the Halkin mountain lime. Blocks made of good hydraulic lime would go on hardening under water just as well as above. It must be kept above water to acquire sufficient solidity to bear moving.

Mr. George Rennie, engineer, objected to the "use of any artificial or inferior materials, such as concrete" in any part of the breakwater. He said,—

"We find that almost all limes are soluble in water, except what they call hydraulic limes, and many of them also are subject to it; that is the experience of the French engineers. Since those works at Algiers began, I have talked with French engineers about them; the masses are dissolving, many of them.

(*Captain Brandreth.*)—What li me do they use?—They use a hydraulic lime, but it is not proof against this effect.

But we have limes that will not dissolve under water?—Yes, I think the lias lime stands remarkably well, and the Halkin lime; but General Pasley's experiments are very convincing upon that subject."

Mr. Jesse Hartley, engineer, considered that masses of brick put together with good cement would be as capable of enduring a crushing weight as blocks of limestone. Was not disposed to recommend concrete as wholly to be used. Considered the blue lime of Lyme Regis very inferior to the Halkin lime. Thought concrete, if it could be kept compact till it was set, the best thing that could be had for the foundation of any building, submarine or otherwise. Would rather use bricks than Portland stone, because Portland stone gets eaten by worms. Would use rough bricks rather than smooth, and to save time would introduce a little iron hooping.

Mr. G. Godwin, architect, had been led to give attention to concrete by offer of a medal by the Royal Institute of Architects.

"Your object was to see by your representations and statements of concrete if you could get the prize?—Exactly.

Did you succeed in getting the prize?—I did.

Do you know any sub-marine work of ancient date in which concrete was used?—I know of no actual work. We have instructions for the preparation of sub-marine foundations of concrete by Vitruvius and by writers of more recent date, Alberti, Philibert de l'Orme, Belidor, &c.

Do you think it fully ascertained that in ancient times concrete was used for the foundations of the greatest buildings?—I do; concreted masses are found in Mexico, and in Egypt, and in Greece, and even more so in Rome. Stuart and Revett speak of some part of the Propylæa at Athens as being of concreted work, and say it is almost impenetrable."

He considered that well made concrete increases in solidity and hardness by age, and in time assimilates to rock. Thought, when exposed alternately to wet and dry, that frost had an effect upon it, the more so, as in practice it is seldom allowed to solidify properly before being exposed to the action of the water. Believed there was, amongst architects and builders, a general confidence in the use of concrete for foundations of buildings. The new houses of Parliament stand on a bed of concrete. Concrete and York landings were, he believed, introduced under the London Custom-House, when the original foundation failed. Had never heard of its failure in the position of a foundation.

(*Chairman.*)—As you have given more attention to the subject than any other person in this country, what is your opinion as to the solidity and durability of well made concrete?—I must not claim that character; I have given a good deal of attention to it, but there are gentlemen who have given much more:—as far as my investigation goes, for foundations, I think there can be nothing better.

Do you mean foundations on land, or do you mean to include foundations in deep water in the sea?—Foundations in deep water also, when made with hydraulic lime, and properly laid."

"Do you think blocks of concrete, 10 feet long, 5 feet wide, and 3 feet thick, made with the best hydraulic lime, may be relied upon for

their solidity and durability if used in the lower part of a wall to be built in Dover Bay?—I attach the greatest importance to concrete in its use as a whole, as a mass. The larger you can make the foundation of a building as a whole, the more safe a building is, as a snow-shoe enables a man to walk over snow without sinking. In using it in blocks we depart from its legitimate application."

Witness considered that a more perfect foundation could be formed by concrete poured in as a whole than of bricks and cement. If called on to construct a wall in the water, of large masses of brick formed into a block with cement, or concrete formed into blocks, each block being 10 feet by 3 feet by 2 feet, would prefer the brick and cement. Had recently examined the river wall at Woolwich, constructed about eight years ago, and found that the lower part of it, to a height of four or five feet from the bottom, is perfectly sound on the face: for three or four feet above that it is injured. It appeared to him that the alternations of wet and dry, the frost acting upon it, had eroded the face of it two or three inches in depth; but behind that it is perfectly sound. With great force, he could hardly detach one of the pebbles from the broken places. Had watched the wall when in progress, and considered then that it was putting concrete to too severe a test.

Commander Carpenter gave some particulars of the breakwater at Algiers, now being constructed by the French of *blocks* of concrete, though stone is abundant in the neighbourhood. The blocks are made 14 feet long and 9 feet wide, and generally contain about thirty tons of concrete each. It is estimated to cost about a million sterling.

Sir Robert Smirke, architect, in a letter to the chairman said, "If it is proposed to make masses of concrete of the dimensions stated, and employ them as blocks of artificial stone to form a sea-wall, I cannot believe, as far as my experience enables me to judge, that concrete of lime and gravel so employed will be found to answer the purpose: I think it would fail.

Such masses, made of very hard bricks and cement, would certainly be durable, and bear great pressure, but they would probably be more expensive than stone."

We will only add at present, that *Mr. Corderoy* estimates the price of a cubic foot of brickwork in

Pure cement at	£1	4	3
Add floating and setting	0	5	0
	1	9	3

The price of one yard of concrete with one-twelfth of blue lias lime, and one-twelfth of puzzolana, with the setting, he calculates at 13s. 9½d., or less than half the cost of brickwork,

ARCHITECTURAL NOTES ON CONWAY CASTLE, &c.

THERE are few places in the kingdom, of equally diminutive extent, more interesting than the little town of Conway. The picturesque beauty of its situation, and the venerable aspect of its grey walls and towers, with the magnificent castle predominating over all, cannot but have left an impression on the mind of every traveller of taste who has been whirled along the great road from Chester to Holyhead. Strange to say, comparatively few tourists do more than give a cursory glance at the objects it presents to their notice, being anxious to hurry forward to the wilder and more stupendous scenery of the Snowdonian range, of which the mountains hereabouts are only outposts. A few days' ramble, however, in the neighbourhood, would amply reward the researches of the botanist, the geologist, the antiquary, or the mere lover of the picturesque. The writer of these notes (though, properly speaking, he has no claim to take high rank in any of these classes) could not refrain, during some weeks rustication recently within a few miles of Conway, from making a few pen and pencil memoranda in each department. The present remarks will of course be confined to those objects which fall more immediately within the province of THE BUILDER.

In some respects the town of Conway is unique, in this kingdom at least, as a remnant of antiquity. Could we imagine a *fossil* town of the thirteenth century, disinterred from the dust and slumber of ages, as Pompeii and Herculaneum have been, with the *enceinte* of its walls perfect, its watch-towers standing in their original integrity, its gates of entrance undisturbed, its castle remaining for the most part as in the days of the first Edward—just such a town would be idealized as Conway now presents itself to us in bodily shape. Here are also other sources of interest to a reflective mind, illustrating by strong and even startling contrasts the progress of civilization in our land, as exhibited in the architectural and engineering works of successive periods of our history. On the summit of a high hill overlooking the town, lie the remains of the ancient city, or fortress, of Caerleon, evidently the work of a people little, if at all, more advanced in art than the aborigines of New Zealand. The castle and walls of the town present a lively picture of the middle ages.

The elegant suspension-bridge, lightly spanning the river with its lace-like meshes, and the works on Telford's line of road illustrate the advances of modern society; whilst the railway now in progress, pushing its embank ment half way across the river, boring through the old walls and tunnelling under the town, points with prophetic finger along the opening vista of the future. Though Conway Castle and walls be the especial subject of this paper, yet a cursory glance may be permitted at the more ancient as well as the more modern objects of interest just referred to.

The remains of the city of Caerleon occupy the summit of a rocky and precipitous ridge, about a mile and a half from Conway, overlooking the sea on one side, and on the other, commanding rather an extensive prospect over an undulating country landward. The top of the mountain is encircled by an *agger* or rampart of rough unhewn stones, which is still of great thickness, and has probably been of considerable height. The stones shew no appearance of having been *built* in the manner of masonry of even the rudest construction, but have evidently been piled up in the manner of a mound. The line of wall, particularly on the landward side, shews some skill in choosing the best points of defence. At the western end, there is a separate enclosure of an irregular form about 100 yards by 30, with a similar rough rampart surrounding it. The area of the larger inclosure is covered, wherever the rugged nature of the site affords level space, with structures of a circular form, varying in diameter from 18 feet to about 30 feet. They are built with rough stones without any cement, and in general have one aperture for access. The ruins do not stand at present more than a foot above the green sward, so that whether they were originally conical buildings roofed with stone, or merely the foundation was of stone and the superstructure of lighter material it is now impossible to ascertain. The curve of the circle is in all cases well formed, but no regularity is observable in the position of the buildings, being placed without regard to order wherever a locality offered itself. That these buildings, whatever was their construction, were dwellings, there is little reason to doubt. It is a singular fact, that in all countries, in the earlier and ruder states of society, the habitations of the people have been of a circular form. The wigwam of the Indian, the hut of the South Sea Islanders, are circular in plan. The huts of the ancient Italians, as depicted on vases of the most remote antiquity, were also circular. Whether this similarity arises from the greater simplicity of construction in this form operating independently in each case, or whether it is indicative of a common original we cannot now discuss.

The remains of the dwellings of Caerleon are called by the tradition of the country "*Cyttian Gwyddelod*," or the houses of the Irish. Does this tradition point to the Scoto-Irish immigration from the west, of which there are traces more or less distinct, not only in Scotland, but in other parts of the island? However this may be, there is no question of their very remote antiquity, and they are interesting as affording traces, faint though they be, of the very earliest inhabitants of the country.

Conway Castle, it is scarcely necessary to state, was erected by Edward I. in the year 1284, at the period of the final subjugation of the principality, at which time also the fortifications of the town were constructed. The place appears to have been subjected to extremely few vicissitudes. Although it sustained a siege and capture in the civil wars, it escaped the fate which befel so many noble structures, that of being blown up with gunpowder. Had it not been for the vandalism of the Earl of Conway, who obtained a grant of the castle from the first and second Charles, it might have remained to this day unscathed. This worthy, in the year 1665, for the paltry value of the lead and timber, completely gutted the entire edifice, and left it much as it now stands. At present the roofs and floors are gone, and the staircases broken down for the most part, but in other respects the building remains in its pristine integrity.

Though not as extensive as Caernarvon, Caerphilly, Ragland, and some others, Conway is still a noble specimen of the Plantagenet or Edwardian castle. It stands on a bold precipitous rock, at an angle formed by the junction of the small river Cyffin with the Conway river. The rock on which it is situated is composed of argillaceous schist alternating with limestone, with veins of quartz interfused. The strata are thrown up at an angle of 45° to 60° with the horizon.

The plan of the castle is a parallelogram, or oblong square, somewhat curved on the south side, to accommodate the building to the form of the site. At the four corners, and at equal distances along the two longer sides, rise eight circular towers, about forty feet in external diameter. Internally, the inclosure is divided into two unequal portions, forming the outer and inner "baileys," by a strong embattled wall. The entrance is at the west end, between two massive towers, connected by a curtain wall thirteen feet thick. The archway is furnished with a portcullis, and the wall between the towers is crowned with machicolations projecting about four feet from the wall. This entrance opens on a terrace raised considerably above the ground outside the castle, and protected by a wall flanked by five turrets. The outer entrance is not opposite the inner one, but is placed laterally at one end of the terrace, with external barbican, drawbridge, gateway with portcullis, and another gateway with hanging doors.

Entering through the gateway into the outer court, we have on the right the great hall, about 130 feet by 32 feet. This is rather singular in its plan, being curved in form to correspond with the curve in the outer wall. It is carried up in one story the full height of the building, and one half, divided longitudinally, has had a basement story. The construction of the roof has been somewhat remarkable. In place of the complicated and beautiful wood trusses which usually span the walls of similar apartments, there are eight stone-pointed arch ribs, of low two-centred shape, rising about half their span, which have supported the purlins and covering of the roof. The effect is simple and bold, but with walls of less thickness than 12 feet, as these are, the result of the lateral thrust might be disastrous. The east end of the hall has a semicircular-headed window, which has been filled in with decorated tracery, nearly the whole of which has disappeared. Looking on the court are three windows with equilateral pointed heads, which have had tracery of similar character. On the external side are six narrow square-headed windows, with transoms. The recesses of all the windows, which are about 8 feet in depth, are furnished with stone benches round. From one of these recesses a door opens into the spiral staircase of one of the towers (called the Prisoners' Tower). The only other entrance is by a door with pointed head opening from the court. The hall has three fireplaces, one at the west end, and two on the north side, next the court. The fireplaces throughout the castle are curious and interesting in their character. Like all the rest of the work, the masonry of them is excellent. The jaumbs are

To ascertain this, I put a block of concrete into distilled water, and on examining the water a week afterwards, I found a trace of lime in it. I then consulted Mr. Faraday, and he said that he thought it probable that there was a little uncombined lime, but that if I would wash it and suspend it in the river six months, he would then try it. I suspended a block in the river at Woolwich six months; I then took it up and let it soak for a week in distilled water, and there was not a single trace of lime in the water, shewing that there is no chemical action of the water upon the hydraulic lime.

(*Sir Howard Douglas.*)—What do you think is the adhesive strength of concrete of the best material compared with that of stone, say York stone or Portland stone?—It depends upon what kind of power you use. As resisting a crushing power, I should think about a third or a fourth."

A concrete of blue lias lime and shingle, thrown into the water at Bridport Pier, without any precaution, "is now in such a state of solidity that it admits of being broken and polished, and it is as hard as any pudding stone, in fact nearly as hard as the flints of which it is composed."

Witness thought concrete would resist a crushing power of, probably, a ton on a square inch. Did not propose to use it where it would be exposed to mechanical action. Proposed to use the blue lias lime from Lyme Regis, being the nearest, cheapest, and, as he thought, the best. Was satisfied that blue lias lime would stand in salt water without the use of puzzolana or cement, but was not yet quite determined as to the most economical proportions. Was disposed to think it would be desirable to keep the blocks a year before they were put into the water.

Mr. W. Cubitt, engineer, being asked by the chairman if he had been in the habit of using concrete, replied:—

"I have done as much in concrete within five miles of Dover as would almost form one face of this breakwater.

What is your opinion of its solidity?—I am of opinion that where you have a concrete very good it will stand a great deal of wear and tear. But I have also another opinion, that in that neighbourhood it is difficult to make concrete which is fit for this purpose without mortar of a peculiar quality. I built a sea-wall between Dover and Folkstone a mile in length, the deepest part of which is 70 feet from the base to the top, and every where in the face of that which was accessible to the sea I lined it with the very hardest brick I could find; and even that will not stand the wear and tear of the sea, for I have known them wear into holes, and then you have to cut out pieces and replace them. Where the sea and shingle have acted upon it, it is like scrubbing it out with a hard scrubbing brush.

Suppose the masses of concrete to be used to within three or four feet of low spring tides, do you think they would last long?—They would, for the upper surface lasts a long time, according to the goodness.

Do you consider that concrete of the best quality would be a suitable foundation for the wall in Dover Bay?—Yes, I should conceive that good concrete would; but I doubt whether you would get it; because I do not think, in the quantities there wanted, it is to be got. In the first place, there is no lime of the quality fit to make concrete for this purpose; for the only lime that is fit is to be had in one place, that is, such lime as is being now used by Mr. Hartley, the engineer, at Liverpool."

This lime came from the Halkin mountains in North Wales.

Mr. J. M. Rendel, engineer, was disposed to recommend brickwork built in large masses with cement, and carried out and put in position. When asked the grounds of his recommendation, said:—

"The experience which I have had is rather from some experimental blocks made at Birkenhead. In a very early stage of our proceedings there last year I caused a number of brick piers to be built at about the level of low water, in order to test the goodness of the different kinds of mortar we were making, and those piers were constructed where every tide washed them. Two months after they had been set I had them knocked to pieces, and it was with the greatest difficulty, the cement being nothing more than good hydraulic lime mortar. They were columns of about 4 feet square and 8 feet in height. Some of those masses remained until about a week ago, when I caused them to be lifted by the upper courses, for which the adhesion of the mortar to the bricks was sufficiently strong, the mass being five to six tons, and quite solid, although, as I said before, they had been built very near low water, and, consequently, from the day they were built they had been exposed to the almost constant action of the sea."

These masses were 4 feet square by 8 feet high, and, taking them at 120 lbs. the cubic foot, weighed about six tons each. When asked what crushing power such masses would bear, said, the commissioners might infer it from the fact, that a chimney at Glasgow, which is 360 feet high, had never shewn the slightest symptoms of crushing at the lower courses, although nothing more than common brickwork. Witness did not believe there was an instance upon record, where a wall had fallen from the *crushing of the bricks*.

He was asked the difference in weight between brick and concrete, and replied:—

"The heaviest concrete I have ever had an opportunity of weighing was about 138 lbs. to the cubic foot; now ordinary brickwork in cement will be about 120 lbs.

What is Portland stone?—About 140. Good concrete is about the weight of Portland stone; but then it requires the concrete to be very well made; and I doubt whether you could accomplish that weight in very large masses of concrete.

(*Captain Beaufort.*)—What is the weight of granite?—164, and limestone about 170, and Bath stone is about 132; but you may press bricks in making them, so that the masses of brickwork will be actually heavier than granite.

(*Captain Brandreth.*)—Would the expense be much increased by that?—I think the expense would be increased; it would be about 2s. or 3s. a thousand more the moulding.

(*Captain Washington.*)—Would you make those bricks by machinery?—No; I do not like machine-made bricks. We are making at Birkenhead now more than 60,000,000, and I find that good hand-made bricks, thoroughly well made, are better than those made by machinery."

As to concrete, witness said until he saw chimneys built of concrete as high as our brick chimneys, should have a preference for brickwork. "I cannot bring myself, as a practical man, to the opinion that masses of concrete can ever be made as sound as masses of brick-work; and for this reason, if I build a mass of brickwork, I can depend upon every part of it being equally sound; but I know no plan by which large masses of concrete materials can be so thoroughly coated with lime, as to obtain the same certain results."

"You would not recommend blocks of concrete as a substitute for stone for facing or building breakwaters?—No, I would not take the responsibility. I approve highly of its use in many kinds of foundations, but not when made in separate blocks, and employed in the construction of walls."

Said he would not use it in blocks for the foundation, even, of the Dover Breakwater.

Thought the price of the brick blocks would be about 27s. a cubic yard. Concrete for such a purpose must not have less than one-sixth of ground lime in its composition. Thought no lime so good for the purpose as the ordinary blue lias, which hardens earlier than the Halkin mountain lime. Blocks made of good hydraulic lime would go on hardening under water just as well as above. It must be kept above water to acquire sufficient solidity to bear moving.

Mr. George Rennie, engineer, objected to the "use of any artificial or inferior materials, such as concrete" in any part of the breakwater. He said,—

"We find that almost all limes are soluble in water, except what they call hydraulic limes, and many of them also are subject to it; that is the experience of the French engineers. Since those works at Algiers began, I have talked with French engineers about them; the masses are dissolving, many of them.

(*Captain Brandreth.*)—What li me do they use?—They use a hydraulic lime, but it is not proof against this effect.

But we have limes that will not dissolve under water?—Yes, I think the lias lime stands remarkably well, and the Halkin lime; but General Pasley's experiments are very convincing upon that subject."

Mr. Jesse Hartley, engineer, considered that masses of brick put together with good cement would be as capable of enduring a crushing weight as blocks of limestone. Was not disposed to recommend concrete as wholly to be used. Considered the blue lime of Lyme Regis very inferior to the Halkin lime. Thought concrete, if it could be kept compact till it was set, the best thing that could be had for the foundation of any building, submarine or otherwise. Would rather use bricks than Portland stone, because Portland stone gets eaten by worms. Would use rough bricks rather than smooth, and to save time would introduce a little iron hooping.

Mr. G. Godwin, architect, had been led to give attention to concrete by offer of a medal by the Royal Institute of Architects.

"Your object was to see by your representations and statements of concrete if you could get the prize?—Exactly.

Did you succeed in getting the prize?—I did.

Do you know any sub-marine work of ancient date in which concrete was used?—I know of no actual work. We have instructions for the preparation of sub-marine foundations of concrete by Vitruvius and by writers of more recent date, Alberti, Philibert de l'Orme, Belidor, &c.

Do you think it fully ascertained that in ancient times concrete was used for the foundations of the greatest buildings?—I do; concreted masses are found in Mexico, and in Egypt, and in Greece, and even more so in Rome. Stuart and Revett speak of some part of the Propylæa at Athens as being of concreted work, and say it is almost impenetrable."

He considered that well made concrete increases in solidity and hardness by age, and in time assimilates to rock. Thought, when exposed alternately to wet and dry, that frost had an effect upon it, the more so, as in practice it is seldom allowed to solidify properly before being exposed to the action of the water. Believed there was, amongst architects and builders, a general confidence in the use of concrete for foundations of buildings. The new houses of Parliament stand on a bed of concrete. Concrete and York landings were, he believed, introduced under the London Custom-House, when the original foundation failed. Had never heard of its failure in the position of a foundation.

(*Chairman.*)—As you have given more attention to the subject than any other person in this country, what is your opinion as to the solidity and durability of well made concrete?—I must not claim that character; I have given a good deal of attention to it, but there are gentlemen who have given much more:—as far as my investigation goes, for foundations, I think there can be nothing better.

Do you mean foundations on land, or do you mean to include foundations in deep water in the sea?—Foundations in deep water also, when made with hydraulic lime, and properly laid."

"Do you think blocks of concrete, 10 feet long, 5 feet wide, and 3 feet thick, made with the best hydraulic lime, may be relied upon for

their solidity and durability if used in the lower part of a wall to be built in Dover Bay?—I attach the greatest importance to concrete in its use as a whole, as a mass. The larger you can make the foundation of a building as a whole, the more safe a building is, as a snow-shoe enables a man to walk over snow without sinking. In using it in blocks we depart from its legitimate application."

Witness considered that a more perfect foundation could be formed by concrete poured in as a whole than of bricks and cement. If called on to construct a wall in the water, of large masses of brick formed into a block with cement, or concrete formed into blocks, each block being 10 feet by 3 feet by 2 feet, would prefer the brick and cement. Had recently examined the river wall at Woolwich, constructed about eight years ago, and found that the lower part of it, to a height of four or five feet from the bottom, is perfectly sound on the face: for three or four feet above that it is injured. It appeared to him that the alternations of wet and dry, the frost acting upon it, had eroded the face of it two or three inches in depth; but behind that it is perfectly sound. With great force, he could hardly detach one of the pebbles from the broken places. Had watched the wall when in progress, and considered then that it was putting concrete to too severe a test.

Commander Carpenter gave some particulars of the breakwater at Algiers, now being constructed by the French of *blocks* of concrete, though stone is abundant in the neighbourhood. The blocks are made 14 feet long and 9 feet wide, and generally contain about thirty tons of concrete each. It is estimated to cost about a million sterling.

Sir Robert Smirke, architect, in a letter to the chairman said, "If it is proposed to make masses of concrete of the dimensions stated, and employ them as blocks of artificial stone to form a sea-wall, I cannot believe, as far as my experience enables me to judge, that concrete of lime and gravel so employed will be found to answer the purpose: I think it would fail.

Such masses, made of very hard bricks and cement, would certainly be durable, and bear great pressure, but they would probably be more expensive than stone."

We will only add at present, that *Mr. Corderoy* estimates the price of a cubic foot of brickwork in

Pure cement at	£1	4	3
Add floating and setting	0	5	0
	1	9	3

The price of one yard of concrete with one-twelfth of blue lias lime, and one-twelfth of puzzolana, with the setting, he calculates at 13s. 9½d., or less than half the cost of brickwork,

ARCHITECTURAL NOTES ON CONWAY CASTLE, &c.

There are few places in the kingdom, of equally diminutive extent, more interesting than the little town of Conway. The picturesque beauty of its situation, and the venerable aspect of its grey walls and towers, with the magnificent castle predominating over all, cannot but have left an impression on the mind of every traveller of taste who has been whirled along the great road from Chester to Holyhead. Strange to say, comparatively few tourists do more than give a cursory glance at the objects it presents to their notice, being anxious to hurry forward to the wilder and more stupendous scenery of the Snowdonian range, of which the mountains hereabouts are only outposts. A few days' ramble, however, in the neighbourhood, would amply reward the researches of the botanist, the geologist, the antiquary, or the mere lover of the picturesque. The writer of these notes (though, properly speaking, he has no claim to take high rank in any of these classes) could not refrain, during some weeks rustication recently within a few miles of Conway, from making a few pen and pencil memoranda in each department. The present remarks will of course be confined to those objects which fall more immediately within the province of The Builder.

In some respects the town of Conway is unique, in this kingdom at least, as a remnant of antiquity. Could we imagine a *fossil* town of the thirteenth century, disinterred from the dust and slumber of ages, as Pompeii and Herculaneum have been, with the *enceinte* of its walls perfect, its watch-towers standing in their original integrity, its gates of entrance undisturbed, its castle remaining for the most part as in the days of the first Edward—just such a town would be idealized as Conway now presents itself to us in bodily shape. Here are also other sources of interest to a reflective mind, illustrating by strong and even startling contrasts the progress of civilization in our land, as exhibited in the architectural and engineering works of successive periods of our history. On the summit of a high hill overlooking the town, lie the remains of the ancient city, or fortress, of Caerleon, evidently the work of a people little, if at all, more advanced in art than the aborigines of New Zealand. The castle and walls of the town present a lively picture of the middle ages.

The elegant suspension-bridge, lightly spanning the river with its lace-like meshes, and the works on Telford's line of road illustrate the advances of modern society; whilst the railway now in progress, pushing its embank ment half way across the river, boring through the old walls and tunnelling under the town, points with prophetic finger along the opening vista of the future. Though Conway Castle and walls be the especial subject of this paper, yet a cursory glance may be permitted at the more ancient as well as the more modern objects of interest just referred to.

The remains of the city of Caerleon occupy the summit of a rocky and precipitous ridge, about a mile and a half from Conway, overlooking the sea on one side, and on the other, commanding rather an extensive prospect over an undulating country landward. The top of the mountain is encircled by an *agger* or rampart of rough unhewn stones, which is still of great thickness, and has probably been of considerable height. The stones shew no appearance of having been *built* in the manner of masonry of even the rudest construction, but have evidently been piled up in the manner of a mound. The line of wall, particularly on the landward side, shews some skill in choosing the best points of defence. At the western end, there is a separate enclosure of an irregular form about 100 yards by 30, with a similar rough rampart surrounding it. The area of the larger inclosure is covered, wherever the rugged nature of the site affords level space, with structures of a circular form, varying in diameter from 18 feet to about 30 feet. They are built with rough stones without any cement, and in general have one aperture for access. The ruins do not stand at present more than a foot above the green sward, so that whether they were originally conical buildings roofed with stone, or merely the foundation was of stone and the superstructure of lighter material it is now impossible to ascertain. The curve of the circle is in all cases well formed, but no regularity is observable in the position of the buildings, being placed without regard to order wherever a locality offered itself. That these buildings, whatever was their construction, were dwellings, there is little reason to doubt. It is a singular fact, that in all countries, in the earlier and ruder states of society, the habitations of the people have been of a circular form. The wigwam of the Indian, the hut of the South Sea Islanders, are circular in plan. The huts of the ancient Italians, as depicted on vases of the most remote antiquity, were also circular. Whether this similarity arises from the greater simplicity of construction in this form operating independently in each case, or whether it is indicative of a common original we cannot now discuss.

The remains of the dwellings of Caerleon are called by the tradition of the country "*Cyttian Gwyddelod*," or the houses of the Irish. Does this tradition point to the Scoto-Irish immigration from the west, of which there are traces more or less distinct, not only in Scotland, but in other parts of the island? However this may be, there is no question of their very remote antiquity, and they are interesting as affording traces, faint though they be, of the very earliest inhabitants of the country.

Conway Castle, it is scarcely necessary to state, was erected by Edward I. in the year 1284, at the period of the final subjugation of the principality, at which time also the fortifications of the town were constructed. The place appears to have been subjected to extremely few vicissitudes. Although it sustained a siege and capture in the civil wars, it escaped the fate which befel so many noble structures, that of being blown up with gunpowder. Had it not been for the vandalism of the Earl of Conway, who obtained a grant of the castle from the first and second Charles, it might have remained to this day unscathed. This worthy, in the year 1665, for the paltry value of the lead and timber, completely gutted the entire edifice, and left it much as it now stands. At present the roofs and floors are gone, and the staircases broken down for the most part, but in other respects the building remains in its pristine integrity.

Though not as extensive as Caernarvon, Caerphilly, Ragland, and some others, Conway is still a noble specimen of the Plantagenet or Edwardian castle. It stands on a bold precipitous rock, at an angle formed by the junction of the small river Cyffin with the Conway river. The rock on which it is situated is composed of argillaceous schist alternating with limestone, with veins of quartz interfused. The strata are thrown up at an angle of 45° to 60° with the horizon.

The plan of the castle is a parallelogram, or oblong square, somewhat curved on the south side, to accommodate the building to the form of the site. At the four corners, and at equal distances along the two longer sides, rise eight circular towers, about forty feet in external diameter. Internally, the inclosure is divided into two unequal portions, forming the outer and inner "baileys," by a strong embattled wall. The entrance is at the west end, between two massive towers, connected by a curtain wall thirteen feet thick. The archway is furnished with a portcullis, and the wall between the towers is crowned with machicolations projecting about four feet from the wall. This entrance opens on a terrace raised considerably above the ground outside the castle, and protected by a wall flanked by five turrets. The outer entrance is not opposite the inner one, but is placed laterally at one end of the terrace, with external barbican, drawbridge, gateway with portcullis, and another gateway with hanging doors.

Entering through the gateway into the outer court, we have on the right the great hall, about 130 feet by 32 feet. This is rather singular in its plan, being curved in form to correspond with the curve in the outer wall. It is carried up in one story the full height of the building, and one half, divided longitudinally, has had a basement story. The construction of the roof has been somewhat remarkable. In place of the complicated and beautiful wood trusses which usually span the walls of similar apartments, there are eight stone-pointed arch ribs, of low two-centred shape, rising about half their span, which have supported the purlins and covering of the roof. The effect is simple and bold, but with walls of less thickness than 12 feet, as these are, the result of the lateral thrust might be disastrous. The east end of the hall has a semicircular-headed window, which has been filled in with decorated tracery, nearly the whole of which has disappeared. Looking on the court are three windows with equilateral pointed heads, which have had tracery of similar character. On the external side are six narrow square-headed windows, with transoms. The recesses of all the windows, which are about 8 feet in depth, are furnished with stone benches round. From one of these recesses a door opens into the spiral staircase of one of the towers (called the Prisoners' Tower). The only other entrance is by a door with pointed head opening from the court. The hall has three fireplaces, one at the west end, and two on the north side, next the court. The fireplaces throughout the castle are curious and interesting in their character. Like all the rest of the work, the masonry of them is excellent. The jambs are

sandstone, about ten inches thick, chamfered on the edges, and bonded in courses into the wall. At about 4 feet above the floor, the jaumbs are corbelled out in two courses, and from these corbels the arched mantle springs. Where the jaumbs project from the wall, the corbels, in order to give it strength, are returned anglewise into the wall, as the sketch below may explain.

The entrance from the outer to the inner court is flanked by a loop-holed bartizan, and is secured by a double-barred door.

On the south side of the inner court is a building of two storys; the upper story in one apartment 29 feet by 22 feet, lighted by two square-headed windows, with tracery. The roof has been supported by a stone-arched rib, similar to those in the hall. From this there is a communication with other buildings on the south and east of the court, forming, with the two eastern towers called "Twr y Brenhin," or the King's Tower, and "Twry Ferenhines," or the Queen's Tower, a commodious suite of apartments. These towers are three storys in height, besides the cellars. The eastern end of the castle abuts upon an esplanade or terrace, about 90 feet by 50 feet, raised about 40 feet above the bank of the river, and protected by three towers and an embattled wall. In this front, the windows being comparatively out of danger, are much larger than elsewhere. In the Queen's Tower there is formed in the thickness of the wall a beautiful little chapel, with a groined roof, lighted by three single-light lancet windows, with surbase arches and sedilia round. The manner in which the lights in the multangular sides of the chapel are managed so as to harmonize with the circular form of the tower outside, is ingenious and worthy of notice.

The towers abutting on the outer court are much alike in their general arrangement. The basement story has been used either as a prison or a deposit for stores, the fastenings having been on the outside. The upper storys have been occupied as dwelling apartments, having each windows and huge fireplaces. Each tower has a commodious spiral staircase. On each landing there is a passage pierced in the thickness of the wall, leading to a water-closet, or what would now be termed such, the funnels of which discharge outside the castle walls, near the bottom. The numerous provision of these necessary conveniences is rather remarkable for the age. Even on the walls of the town there are several remains of similar structures, evidently part of the original construction of the masonry. From each staircase there is access to the battlements of the walls, which form a commodious promenade round the entire building, being carried round the inner projection of the towers on corbels. The roofs of the hall and other buildings have been on the same level with the battlements, and being flat and covered with lead, would form very useful platforms in cases of emergency.

The towers are carried up about fifteen feet above the curtain walls, finished, like the walls, with a parapet, loop-holes, and embrasures. The four towers at the angles of the inner court have the inclosure of the staircases carried up about fifteen feet higher, forming turrets or watch towers, crowned with a plain parapet and coping, supported on projecting corbels forming blank machicolations.

With the exception of the suite of apartments in the inner court, the towers and the hall are quite detached, having no communication with each other except from the court or the summit of the walls. The curtain walls are about 11 feet thick, pierced at intervals with arched recesses, with benches round and loop-holes for archery. The walls of the towers and the hall are about 12 feet in thickness.

The principal material used in the construction is the slaty rock on which the castle stands. Limestone is also introduced to some extent. The walls are rubble, but beautifully executed, the face being as smooth and true as any ashlar wall could be, the larger stones well fitted together by smaller ones, the joints remarkably close, and the stones all laid on their natural quarry beds. The curved line of the circular work is worked very true. Many of the coins, some of the arches, and the whole of the tracery, have been executed in siliceous sandstone, which must have been brought from a considerable distance, as there is none in the neighbourhood. Some of the coins are of hewn limestone. Much of the sandstone is honey-combed where exposed to the weather, though in other parts the stones still preserve their masons' marks. The mortar is of very good quality, though not so hard as might have been expected. In the interior of the walls it seems to have been applied in the form of grout, or rather of thin concrete, by the quantity of gravel with which it is mixed.

The strength of the work has been put to a severe test, by some injudicious excavations which have been permitted on the south side. One of the towers having been undermined, the lower portion has fallen away, leaving an awful chasm, whilst the upper portion still remains apparently suspended in mid air.

With the exception of the covering of the roofs, the floors, and the doors, no timber whatever has been used in the construction. The apertures are in general arched over, but with the exception of the little chapel mentioned above, no vaulting or groining is observable through the whole edifice.

In surveying the building generally, we cannot help feeling struck with the evidences of studied preparation and careful superintendence which the work every where exhibits. Every architect knows or should know, that when the details of a building—not merely the exterior but all the internal fittings—have to be carried out in masonry and built in as the work proceeds, not lined up afterwards in the manner of plaster and joiner's work, the utmost precision and the most careful forethought are required. In the present instance the details exhibit a care and accuracy worthy of all imitation.

The walls of the hall and the inner buildings generally, are not tied into the walls of the *enceinte* which appear to have been first completed, and the inner buildings carried up afterwards.

Mention is made in the guide-books of a sally-port and a subterraneous way cut through the rock and opening on the brink of the river. If such a passage ever existed, all traces of it have disappeared. There is a sunk area in the outer court, about 15 feet square, walled round and partly filled with rubbish; it has probably been a water conduit.

The plan of the town walls forms a triangle, with a small part of the apex cut off. The circuit is about two miles. The walls are of the same period, and constructed much in the same manner as the walls of the castle. Far different from the walls encircling the ancient city of Chester, the only other complete mural circuit remaining, which are a patchwork medley of all ages and constructions, the walls of Conway are uniform in their construction and design. Reparations have doubtless taken place, but in perfect accordance with the original plan. They are 6 feet to 7 feet thick, and from 15 feet to 20 feet in height, crowned with a parapet, with embrasures and loopholes. In some places where the wall is particularly exposed, the upper part is machicolated. The wall is defended by semi-circular buttress towers, about 15 feet in diameter, rising about 12 feet above the top of the wall, placed at intervals of about 30 yards. The various flights of steps for obtaining access to the walls and the pathway along the top are still perfect. The walls rise and fall with the inequalities of the surface, which are considerable; but in all cases the courses of wall-stones are set level, and are cut to the slope at the bottom of the parapet, where thin courses on the slope are introduced to form the platform.

The original entrances to the town are three in number. Port Uchaf, or the upper gate; Porth Isaf, or the lower gate; and Porth y Velin, or the mill gate. To the left of the gate the wall exhibits the machicolations above alluded to. In addition to the three principal gates, there are two or three posterns. On the side next the harbour the wall is continued along the bank of the river, and at the two extremities a curtain wall is carried out, terminated by a tower at the water's edge.

The town, internally, contains few objects of interest. There are a few half-timbered houses, and a rather large edifice of the Elizabethan period, now sub-divided into cottages, but presenting no remarkable features. The church occupies part of the site of an ancient Cistercian monastery, but in itself contains nothing peculiar. The little church of Cyffin, about half a mile outside the walls, contains some curious distemper paintings on the walls and ceiling, but in a sad state of mould and dilapidation.

The suspension-bridge over the Conway, and the new road constructed by Telford and completed in 1826, have greatly improved the facilities for travel in this direction. Of the engineering part of the work we will not speak, but in regard to the harmonious connection of the new work with the old, and the preservation of the venerable association with other times intact, too much cannot be said in its praise.

The piers and masonry of the bridge group admirably with the hoary towers of the castle, and when, sweeping round the base of the castle rock, we demand admission into the town, a grated porteullis (or a gate resembling one) under an arch flanked by an "ivy-mantled tower" opens for our admission. At the other side of the town, also, it was necessary to open a new entrance for the improved road. This has been effected under one of the buttress towers without removing the upper part of the masonry, and the arch inserted, though semi-circular in form, in detail, works in well with the old portion.

We should be extremely glad to bestow the same meed of praise on the railway works now in progress, but truth and candour will not admit of it. The piers of the intended tubular bridge were not sufficiently advanced to enable as to judge of their design, but if they are the work of the same artist who has designed the other structures connected with the railway hereabouts, we should not be very sanguine as to the result. The railway passes on an embankment over the road to Llanrwst, immediately outside the wall of the town. The bridge or viaduct is a very flat four-centred arch with square soffit, and faced with channelled rustics! A little further on, the railway pierces the wall, and enters the town under a yawning misshapen four-centred arch of most barbarous detail. The architecture is, in fact, of that delectable description known by the soubriquet of Batty Langley, or cabinet-maker's Gothic. Surely it is not necessary in the construction of a railway that taste and consistency in design should be outraged or despised.

In the erection of stations, architects have sometimes been employed, and many of our railway stations present pleasing compositions. Why should not a little of the same assistance be sought for in the designs for the engineering portions of the work? Until the architect be associated with his brother professor in extensive works of this description, we fear that notwithstanding all the efforts now in progress to diffuse the principles of correct taste amongst the community at large, they will be entirely counteracted by the equally rapid diffusion of tasteless and unsightly, though imposing and expensive objects. J. A. P.

THE IRON TRADE IN FRANCE.—The *Moniteur* contains the following data on the produce and manufacture of iron in France:—"There is not," it says, "a branch of industry occupying more labourers than that of iron. The number engaged in the mines and works are estimated at 51,000. The other individuals employed in carrying the metal, and in various external works, being as numerous, the iron industry affords labour to at lent 100,000 men. The produce in 1845 exceeded 166,000,000 francs. To that human force must be added 2,047 hydraulic-engines, and 207 steam-engines, representing together a power equal to that of 26,504 horses. The number of steam-engines was only 109 in 1840, so that it nearly doubled in five years.

THE TOMB OF A SCIPIO.—We read in the *Impartial* of Franche-Comté, that in digging for the foundation of the Arsenal there, many remains of Roman construction have been found, and of a vast cemetery. A portion of one sepulchral monument bears this incription, "*P. Cornelius Scipio*," and has set the local antiquaries to work.

THORWALDSEN'S LIFE—SKETCHED BY H. E. ANDERSEN.

DERIVED FROM THORWALDSEN'S OWN ACCOUNTS.

The life of Thorwaldsen unrolls one of the fairest pages of art's history, resembling the image of a triumphal procession, in which success and victory, and the full recognition of men, are blended in one fair *ensemble*. Such can be sketched either by words or forms. If we had to compass this biography within the limits of sculptured images, we would trace three distinct *medallions*—one representing a dense Danish beech forest, where King Harold Hildetand (his rich hair encircled by a thick ring of gold) receives the prophetic *omen*, that one of his grandchildren would reign from south to north, and his name be recorded in the annals of men—which, in fine, has been accomplished in the domain of art, in the general homage paid to the Danish sculptor. The intermediate medallion would represent Oluf Paa, a mighty Danish chief, whose art-taste is even praised in the songs of ancient northern bards.—Through the long lapse of generations, features and usages of men are often preserved and refulgent, and thus the mind of Oluf Paa seems to have been inherited and potentized in Bertel Thorwaldsen. And thus, we stand at the portal of a biography—whose inscription is art and complete success.

It was on the 19th November, 1770, that Bertel Thorwaldsen was born, in little Green-street, Copenhagen, not far from the Royal Academy. His father exercised the calling of a form-cutter in wood, his mother was the daughter of a parson, and the family had come from poetic Iceland; all which had its due influence on the rising thoughts and propensities of the future sculptor. The first thing, however, by which the active mind of Bertel was excited, was a rather trivial subject—we mean his mother's spinning-wheel. The Danish poet depicts, with his usual vivid colour, a scene, when the little child did not rest, until (one fine moonlight night) he had a trial at this, to him, mystical machine. A few years since, only, yet lived an old ship's carpenter, who recollected the blue-eyed, fair-looking boy, who came to his father in the carving house, at the wharfs of Copenhagen, to learn the trade. But the intelligent parent felt, from his own deficiency, the great importance of drawing, and thus the lad was sent, at the age of eleven, to the *free school* of the Art-Academy; and in two years had made such progress, that he could not only assist his father, but even correct his rough and unwrought forms. Thus, Thorwalsden's first works were the figure-heads of Danish galleons—"the ever-moving sea baptized them with its brine-waters, and a wreath of Oceanic plants was playing about them." Thus, Bertel remained six years in the free-school of the Royal Academy, mixed among the crowd of others, yet distinguished by his word-spare and intense application at the drawing-board, while his companions poured forth the poverty of their ideas in vain and idle gossip. But there was nothing severe or repulsive in this silence—mildness was in his looks, well-meaningness in his whole behaviour. When seventeen years old, he was confirmed, at which holy rite a curious incident occurred. There was nothing external to distinguish him from the other youths. But it had been stated in the papers, that the pupil Thorwaldsen had gained the small silver prize-medal at the academy, and so the dean asked him: "Is it your brother who won the prize?" to which the lad proudly replied: "It is myself." So, the Very Reverend looked at him pleasingly, and then called him *Mr. Thorwaldsen*. He often used to relate in after life, that this first title bestowed on his art, gave him more pleasure than all the distinctions, kings afterwards showered upon him.

At this time, Thorwaldsen lived in a little house in *Aabenraa*, the street which Holberg makes the abode of poor poets. The smaller gold medal of the R.A. was to be won by a pupil in sculpture—the subject, "Heliodorus expelled the Temple." It was in the Royal Palace of Charlottenburg, in a small chamber, where Thorwaldsen worked at his sketch;—but seized once by the mistrust in himself and apprehension (often the concomitant of true and sincere talent), he left his work in despair, resolved no more to return to it. "But in the life of a man of genius nothing is adventitious—the apparent trifle, the leading hand of a higher divinity." On one of the small stairs in the rear of this house, he was met by one of the professors, who speaks to him, examines him closely, admonishes him to *return*. He does so; and in *four hours* the sketch is done, and the medal won (15th August, 1791). Count Reventlow, Secretary of State, saw this work, and became Thorwaldsen's patron; he procured him employment, and put his name at the head of a subscription for procuring the young man leisure for his studies. In two years more, the large gold medal was won, and thereby a *travelling pension*. But Thorwaldsen very properly decided on going *to school* for the next year, and to acquire some of those literary attainments indispensible to an artist. His leisure time, especially the evenings, he passed convivially with men like Rahbek and Steffens, both, as himself, renowned in after life. At this period, a dog also was his constant companion, to be mentioned on the account of Thorwaldsen having preserved his memory in a marble statue.

It was in the year 1796, that he started for Rome in the frigate *Thetis*, R.N., which parting was painful on his side, as he loved then a beautiful girl. He did not see her again till many years afterwards—he, the first artist of the land, she a widow. But when the almost royal pageant of his funeral passed the streets of Copenhagen, an old lady of the tradesman's class was seen sobbing bitterly at an open window. This was *she*.

In those war-times, the voyage was a very adventurous one, the *Thetis* touching Algiers, Malta, Tripoli, and Palermo—all which scenery and imagery imparted expansion to the young artist's mind. Thus, in February, 1797, he landed at Naples. Alone, without a friend, not knowing the language, despair nearly seized him, and he sought for a ship to return home!—but he persevered, and arrived on the 8th of March at Rome, a day celebrated (wrongly), for a long time, as his birthday. Thorwaldsen had been introduced to the Danish art-critic *Zoega*—who, however, thought him possessed only (like himself) of ordinary talent. Even after three years acquaintance, Zoega still said: "There is much to be blamed—little to be praised; and he is not even industrious." Still, this was the time of which Thorwaldsen said afterwards: "That the ice was melting before my eyes." It was especially Carsten's drawings which much illumined the young sculptor's mind. But his little *atelier* resembled often a battle-field—full of broken and scattered bodies and limbs. His inspirations came often at night, and then he modestly and strivingly destroyed again in the morning, works which would not bear the inspection of the great luminary of day.

Three years had thus elapsed, and *nothing* had been done; the period of departure approached, and the reproach, "That he had absolutely wasted his time in Rome," heavily preyed upon Thorwaldsen. In despair, he modelled "Jason *winning* the golden fleece." There stood the figure modelled in clay—many *gazed* at it—indifferently, and Thorwaldsen smashed it to pieces. He had in April, 1801, to return with Zoega home; but accidents delayed it until autumn. Still, Jason had taken hold of his whole soul; a new, a larger statue of the hero was formed—"an immortal work." But it was not until the crowd began to say: "Here is something more than usual," that he took confidence in himself; and then came Canova, at that time in the prime of fame, and said: "This work of the Danish youngster is made in a novel and grand style." This made Zoega *smile;* he ought rather to have repented.—The greatest aid, however, came to Thorwaldsen from the Danish poetess, *Friedrike Brun*, who not only eulogised Jason in rhyme, but gave the young sculptor (without funds then), money, to have his work moulded in plaster of Paris." Still, the trunk was packed, the last goblet of wine drunk at the parting feast—the vetturino at the door at dawn of day. But another *accident* (?) happened, and Thorwaldsen had to stop one day longer at Rome—but this day *decided a life*. At that period Great Britain had battered down the Danish capital, despoiled it of its fleet—but it was a Briton also, who was instrumental in making the Danish name triumphant in art. His name is *Thomas Hope*. The footman in the hotel had told him, that Canova had spoken of *Jason*, as 'Una opera grandiosa,' and thus Hope came to the lumber atélier, which Thorwaldsen was about to leave for ever. The hero was unveiled, and Hope agreed to give 800 zechines for a copy in marble, although Thorwaldsen had only asked 600. However, by some reason or other, Mr. Hope had to wait twenty-five years for his marble statue—still, Thorwaldsen was *now* a man of fame.

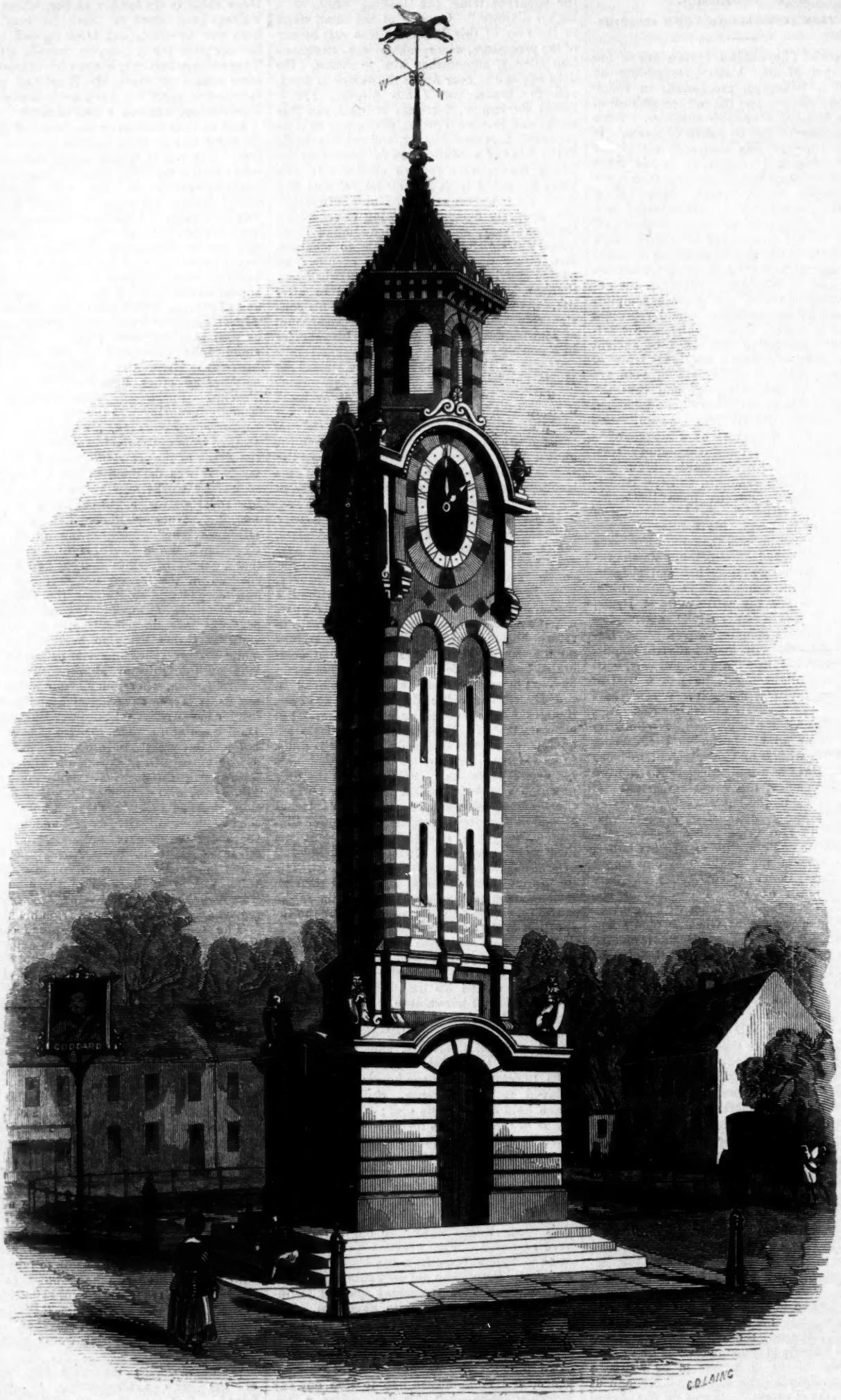
But on thus becoming the favoured of fate, his mind was at times sombre, nay *more* than that. The sun of Naples could not cure him—but finally this was done by friendship and fostering care in the fine Villa Montenero, near Leghorn, belonging to Baron Schubart, Danish Chargé d'Affaires in Tuscany. Thus, health returned to his veins, quiet in the mind, and thus his villaggiatura at Montenero is pourtrayed (and recorded for history) in the two basso-relievos: summer and autumn. Nobles and artists surrounded him here, recognition and admiration on all sides. *The Dance of the Muses*, also, was here carried out in marble—as well as *Amor and Psyche*. That group stood fully completed in the château; a hurricane rises, the lightning strikes and smashes all other figures—save Amor and Psyche. There was some omen in this! Equally favouring was the sea on another occasion—his *Venus with the apple* was saved unscathed from out of the waves, after the news of the wreck of the vessel had arrived in England, where it was destined to come. Rich years of worthy works now rolled on—orders for the royal palace of Copenhagen, the town-hall, &c. Norway being then united with Denmark, the present king (then Prince Christian), wrote in 1811, to Thorwaldsen, that a quarry of white marble had been discovered in the former country, and invited him to come and to "shape the sturdy rock into breathing form, and to pour life-like appearance into its veins." But an important work at Rome came to prevent him for a while—the intended imperial palace for Napoleon on the Quirinal Mount. There were several rooms, where, on all four walls, ample, and as it were, an especial space had been left for basso-relievos; but none thought of the Danish sculptor—about to proceed to his native home. Time pressed on, not a day was to be lost, as the emperor was expected to arrive in May following. In this position of things the architect, Mr. Stern, who conducted the whole construction, chanced to sit next to Thorwaldsen in the academy of St. Luca—and made him there the extempore proposal, to make a frieze of plaster of Paris, *twenty-nine* Danish yards long. But the condition was, that the work was to be finished in three months!! The man kept his word—and '*the triumphal march of Alexander*' issued from his atelier.*

The fame of this work spread over all Europe—in Denmark it rose to enthusiasm. A public subscription was made to obtain a copy in marble: it was ordered by Government.

Thus Thorwaldsen remained in Rome. But another syncope of inactivity (the last, after all), broke over him. Drowned in an unexplained melancholy, he walked about, a shadow of his former times. "In the morn of a splendid hesperian day, after a night spent without sleep, he sat himself instinctively before his wood-frame, placed the wet clay over it, and in an instant his famous basso-relievo, '*The Night*,' was struck out. And as he worked at this inspiration, the dark mist of his mind vanished away; it became day-clear—sun-refulgent day; a joyous serenity, which never afterwards left him." During the course of that day, a Danish friend found him cheerfully playing with his dog and cat (Thorwaldsen being very fond of these *beings*) before the completed relievo. On the same day the moulder came to take it away with him to his workshop; but then Thorwaldsen had already worked, or rather *sorcered*, at his "Day," and said to him, "Wait a little, then both can be moulded together." Thus in one day two immortal works were completed.

[Here *Andersen* concludes the narrative of the art's-apprenticeship of his late friend—that period most instructive and stirring for the art-student;—the after events of Thorwaldsen's life being sufficiently recorded in the current works of biography.]

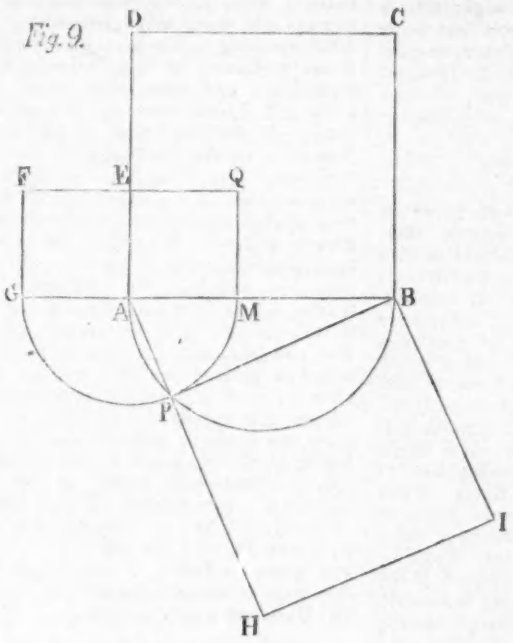
* Of this stupendous scroll of basso-relievos, three copies were subsequently made, besides the Quirinal sketch. The Sommariva one—the Quirinal corrected and completed—and that for the Christiansberg Palace, at Copenhagen.

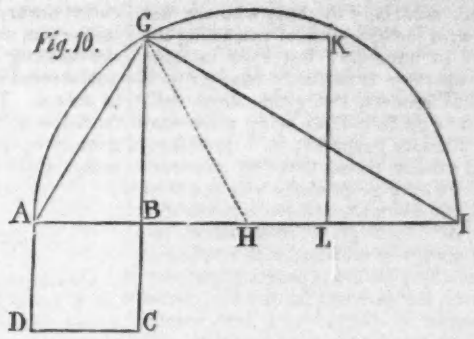


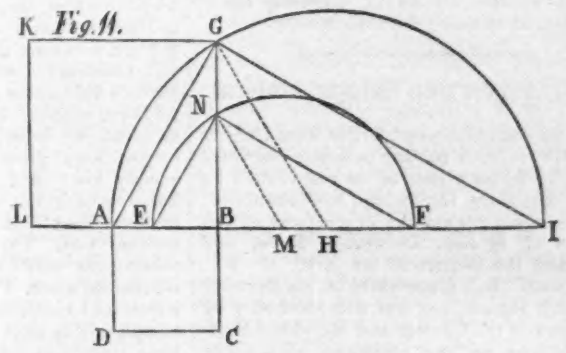
CLOCK-TOWER AND ENGINE-HOUSE, EPSOM.

MESSRS. BUTLER AND HODGE, ARCHITECTS.

GEOMETRY OF THE SQUARE.







CLOCK TOWER AND ENGINE-HOUSE, EPSOM.

On August 2nd, an advertisement appeared in our columns inviting architects to submit designs for the above. From those which were sent in the committee unanimously adopted one by Messrs. Butler and Hodge, of London, an engraving of which we give above.

The extreme height of the tower is about 70 feet, and the openings for the dials are 4 feet 6 inches in diameter. It is to be built of red and Suffolk bricks, the external faces rubbed and finished fairly. The four lions, each bearing shields charged with the arms of the principal noblemen in the locality, and the carved portions, pedestals, &c., are to be of Caen stone. The polychromatic effect of the materials and general proportions promise to make it a conspicuous and agreeable object.

We did not see the other designs.

GEOMETRY OF THE SQUARE.*

Problem.—*To construct a square that shall be equal in area to the difference between two given squares; that is, to subtract one given square from another, and to convert the difference into a square.*

Example.—Let ABCD and AEFG (fig. 9) be the given squares; it is required to subtract the lesser square, AEFG, from the greater, ABCD, and to convert the difference into a square.

Construction.—Place the squares in immediate juxta-position with a side of each in the same straight lines, and upon AE, the side of the lesser square and within the greater, describe the square AEQM, and the intermediate space BCDEQM will be the difference between the given squares, and that which the problem requires to be converted into a square.

Upon AB, the side of the larger square, describe the semi-circle APB, in which, from the point A, inflect the straight line AP, equal to AG or AM, the side of the lesser square, and join BP; then is BP the side of a square which will contain the same area as the intermediate space BCDEQM. On BP describe the square BPHI, and the thing required by the problem is done, for the square BPHI is equal in area to the space BCDEQM contained between the squares ABCD and AEQM.

Demonstration.—Because the angle APB is the angle in a semi-circle, it is a right angle, and, consequently, by the property of the right-angled triangle, the square described upon the side AB, which subtends the right angle, is equal to the sum of the squares of the sides AP and BP containing it; but AP is equal to AM, and, therefore, the square of AB is equal to the sum of the squares of AM and BP; that is, the square ABCD is equal to both the squares AEQM and BPHI; from each of these equals take away the square AEQM, and the remainder BCDEQM will be equal to the square BPHI; consequently, the difference between two given squares has been converted into a square of equivalent area, as required by the conditions of the problem.

Problem.—*To construct a square that shall be equal in area to any proposed multiple, or any number of times a given square; that is, to convert a given square into another that shall contain its area any proposed number of times.*

Example.—Let ABCD (fig. 10) be the given square, of which the side is AB; it is required to convert the square ABCD into another that shall contain its area any given number of times—say three times.

Construction.—Produce AB, the side of the given square, directly forward to I, making BI equal to three times AB, or any other number of times AB, by which the given square is proposed to be multiplied. Bisect AI in H, and on H, as a centre, with the radius HA or HI, describe the semicircle AGI, meeting CB, the side of the square produced in G; then is BG the side of the required square. Upon BG, the side of the square thus found, construct the square BGKL, and it will contain an area equal to three times the given square ABCD.

Demonstration.—We have to prove that BG^2 is equal to $3\ AB^2$; and for this purpose draw the straight lines AG and IG; then, because the angle AGI is an angle in a semi-circle, it is a right angle; and since GB is perpendicular to the diameter AI, the triangles AGB and GBI are similar to one another, and, consequently, their corresponding sides are proportional; that is, AB : BG :: BG : BI; but BI is equal to three times AB by the construction; therefore we get AB : BG :: BG : 3 AB; and by comparing the products of the extreme and mean terms, we obtain $BG^2 = 3\ AB^2$, so that the truth of the construction is manifest.

Note.—There is another mode of finding a square, that shall be any proposed multiple of a given square, in very common use among practical men; but this method is greatly superior in point of facility, as we can obtain any proposed multiple directly, without having first determined the intermediate multiples; it is therefore recommended as being more convenient in practice when the multiple is a high number, and also as involving a principle which is not apparent by the other method.

Problem.—*To construct a square that shall be any sub-multiple of a given square; that is, to divide a given square into any proposed number of equal parts.*

Example.—Let BGKL (fig. 11) be the given square of which the containing sides are BG and BL; it is required to divide the given square BGKL into any number of equal parts—*say three equal parts.*

Construction.—On BL, the side of the given square, take BE of any magnitude at pleasure, either greater or less than BL; produce LB to I, and on BI set off as many times BE as the parts into which it is proposed to divide the square; in the present example three parts. Now since BE has been taken less than BL, the side of the given square, three times BE set off towards I will reach to F: on M as a centre, and with FE as a diameter, describe the semicircle ENF intersecting BG the side of the given square in N, and draw NE, NF; then will BE be the side of a square which contains one-third of the square upon BN. Join NE and NF, and through the point G draw GA and GI respectively, parallel to NE and NF, and meeting the straight line LI in the points A and I; then shall AB be the side of the square sought, and ABCD the required submultiple of BGKL.

Demonstration.—By the principle employed in the construction of the last problem, BN is the side of a square containing three times the area of the square upon BE. But the triangles ENB and AGB are similar; therefore it is, as BN : BG :: BE : BA; and for the

* See pages 269 and 279, ante.

same reason $BN^2 : BG^2 :: BE^2 : BA^2$; but $BE^2 = \frac{1}{2} BN^2$, and consequently $BA^2 = \frac{1}{2} BG^2$, so that the truth of the construction is obvious.

There are many practical cases in which these problems, in reference to the multiplication and division of squares, may be very usefully applied, especially by those who are not conversant with the operation of extracting the square root in numbers; but even in cases where the operator is perfectly familiar with the numerical process, the geometrical delineation is to be preferred, as being more convenient for ultimate purposes; it is therefore, in these and similar cases, that the constructions which we have given above will find their application, and when the process is performed with care and with good instruments, the results may always be obtained with a sufficient degree of accuracy for every practical purpose. And moreover, the ease and facility with which the construction is effected, is a high recommendation of this method of resolving the problems, for in every instance the whole process is performed without the slightest degree of mental exercise beyond the necessary attention required in using the instruments.

TRIAL OF THE DEE BRIDGE GIRDER.

Our own correspondent writes from Chester as follows:—After waiting patiently for some weeks, the fellow girder to the one broken by the accident at the Dee-bridge has been tested, and the result proves the correctness of the evidence of Messrs. Robertson, Robe, and others, and the verdict of the jury.

The proof took place early in the morning of the 8th instant, and was witnessed only by the officers of the Chester and Holyhead Railway Company, no one connected with either the Shrewsbury and Chester Railway Company, or the City of Chester, being present on the occasion.

It was generally thought, from the time that had elapsed since the girder was removed from the bridge and placed upon the temporary supports on the Saltney abutment, that it was waiting the inspection and test of a Government commission (which we observe has only just been appointed by her Majesty), but it is presumed that as they entertained doubts upon the strength of the girder themselves, the proof took place on the eve of the appointment of that commission. It was accomplished with railway bars (seventy-five tons having been brought to the spot for that purpose) suspended from the girder, and the weight was gradually applied and equally distributed over the centre division of the rib (each girder, as our readers are aware, being composed of three divisions or castings), until it reached 38 tons 6 cwt. 2 qrs. 18 lbs., under which it broke. The fracture commenced at the bottom flanges, and proved clearly that it broke by tension. This experiment at once shews the fallacy and utter uselessness of the tension bars in the manner in which they were applied at this bridge.

It is a remarkable circumstance, that notwithstanding the host of engineering talent brought forward to support the theory of the *side blow* asserted with so much earnestness to be the cause of the accident, and which from the support it received had nearly carried conviction to the minds of the coroner and jury, no attempt has yet been made to protect the remaining ribs from similar calamitous *side blows*, but piles have been driven in the bed of the river Dee to support the roadway underneath, from which circumstance we will leave our readers to draw their own conclusions.

The same thing has been done at the bridges on this principle on the Trent Valley Railway. It must be admitted that the works of the Chester and Holyhead Railway are executed in a very unsatisfactory manner, for in addition to the bungling at the Dee Bridge, which "bangs Banagher," they are now taking down the girder bridge over the Chester and Ellesmere canals of 60 feet span, in consequence of some fractures being observed in the masonry at the quoins of the abutment upon which the outside girders rest. The abutments of this bridge are composed of the very soft red sandstone of the district, which is totally unsuited for works that are intended to be of a strong and substantial character, as a mere casual inspection of many of the public buildings of Chester amply testifies.

We warn the Government to see that the works of this railway are minutely inspected by shrewd practical *civil* engineers, before the opening of the line (as from these two failures we may fairly infer it is urgently required); their responsibility will be great should another catastrophe similar to the Dee bridge accident occur, and it is not a mere superficial inspection, such as generally takes place before the opening of railways, that will satisfy the public mind in this case, even if it ought to do so in others. The numerous accidents that occur from the defective works of railways, require greater vigilance on the part of the Government, if not legislative interference.

ART FOR THE PEOPLE.

Considerable improvements are going on in Windsor Castle, and it is understood that, at the request of her Majesty, a further portion of the palace will be opened on the public days, including many fine works of art not now exhibited.—There is no doubt that the rumour which we first announced, that the paintings in Buckingham Palace will be opened to the public on certain days is correct.—On Friday last including the evening, more than 17,000 persons visited the Art-Union of London Exhibition, without the occurrence of a single accident or injury. The crowding was, of course, very great, and the officers of the society had hard work for many hours in keeping back the visitors and admitting them in detachments, as others left the rooms by another way. This would be avoided if the subscribers would avoid postponing their visit till the last week. For the first fortnight during which the exhibition was open, the rooms were comparatively clear. The various works of art have since been taken away by their respective owners, and the rooms are being fitted up for the schools of art about to be established by the Society of British Artists.

The fine exhibition of paintings in Westminster Hall is drawing to a close, and fears are entertained and loudly expressed, lest no further opportunity of exhibiting their productions should be afforded to the body of artists called into being by the proceedings of the royal commissioners. We understand that the council of the Art-Union of London have been solicited, as a neutral body associated for the promotion of the arts, to aid in organizing a biennial or triennial exhibition, with the view of preventing this.

PRESENT STATE OF THE PARTHENON.

Mr. G. Knowles has recently published a plan of the Parthenon, on a scale of 50 feet to 3 inches, shewing its actual state with great minuteness,* and particularly the ichnographic disposition of the columns of the interior not before given. In 1842 the Archæological Society of Athens removed the mosque which, during many years, had occupied the greater part of the cella of the Parthenon, and the internal arrangement of the columns became evident by unquestionable indications on the paving. "It appears," says Mr. Knowles, in a page of letterpress accompanying the plan, "that the axes of the columns were placed upon the joints of the slabs composing the pavement, precisely according to the system observed in the interior peristyle of the temple itself. It is conjectured that the angles were supported by pilasters, as well from the evidence of a corresponding one actually existing in the south-eastern end of the cella, as from the requirement of the intercolumniation: but it must be stated, that no distinct traces of such pilasters have been discovered."

The plan gives the measurement of every piece of the pavement remaining, and all "marks and indications upon the surface of the plan of the temple, which might, by possibility, assist the future investigation of these precious remains."

Cemetery for the Army and Navy.—A grand cemetery for the officers of both services on *Shooter's* Hill (appropriate site) is talked of.

* "Ground Plan of the actual state of the Temple of Minerva at Athens." By George Knowles. G. Bell, Fleet-street.

PURCHASE OF SHAKSPEARE'S HOUSE.

On Thursday, the 16th, the long-talked-of sale of the reputed birth-place of the "myriad-minded" man, Shakspeare, took place. The lower room was crowded long before the time appointed for business, and a move was made to an apartment upstairs, where, by the time Mr. Robins entered the rostrum, every corner was filled, including the lobbies and landings outside. After the auctioneer had read the particulars and made some preliminary observations, including replies to questions which were raised first as to its being in truth the poet's birth-place, and secondly as to the goodness of the title, 2,000*l.* were bid. A paper was then handed to the auctioneer, which after some hesitation he read, containing an offer of 3,000*l.* from the United Stratford and London Committees, made, it was stated, under a feeling of the duty imposed on them, and for which amount they must look to the public, the present subscriptions being quite inadequate. After a pause, somewhat exciting, the auctioneer said the trustee, before entering the room, had reserved to himself the right of making one bid; he was now authorized to say the trustee would make *no* bidding: so after waiting a certain time, to give any individual who wished to advance the opportunity of doing so, the property was knocked down to the Committee at a quarter to two o'clock, for the sum they had offered, amidst such cheers as the "mart" had never before echoed. The visiters' books of autographs, five in number, were then put up in one lot, and the offer of 50*l.* for them was made on behalf of the Committee, but they were ultimately bought for 73*l.* 10*s.*, by Mr. Butler of Upper Clapton.

NOTES IN THE PROVINCES.

Contracts are ready to be entered into for the erection of a spacious range of buildings at Woolwich for store-rooms, to be proceeded with immediately, on plans already prepared, with an estimated expenditure of 30,000*l.* The additional rooms and other buildings, forges, &c., for the studies of cadets in military and naval engineering, are partly built and partly in progress. Previous to the reinforcement of 4,000 artillerymen at the barracks also, the officers' present quarters are to be converted into accommodation for the men, and a spacious range of new buildings erected, from plans also prepared, for officers' quarters. ——The new marine barracks which were to have been erected by the Admiralty at Gosport, have been stopped, it is said, by the Board of Ordnance, to whom the ground belonged, and from whom it would appear to have been taken on the very reasonable principle of 'what is yours is mine' but without the indispensable ceremonial of saying 'by your leave;' whereas the Ordnance department of this 'divided house' required it for fortification. Meantime, however, other obviously assailable points, it is said, have been left for years unfortified, although a deep trench was begun in partial prosecution of a plan proposed for the more complete protection of the dockyard and arsenal by a connection of the wall and bastions of Portsmouth and Portsea, where, says a Hampshire paper, "the most inexperienced eye can detect in a moment the very defenceless situation of this part of the garrison." Here, it is said, would be ample room for spacious marine barracks, such as those proposed, were the fortification completed, and the whole thus 'rendered almost invulnerable.'——The largest riding-school in England, excepting that in Bryanstone-square, it is said, has just been completed at Southampton: length, 122 feet; breadth, 43 feet. The roof is in the style of that of Westminster Hall. The late manager of the Brighton school is the master.——The erection of a new poor-house for Southampton, say the local papers, seems now a settled certainty.——Complaints prevail of the state or nature of the water supplied to Southampton, partly from the artesian well and partly from the Northam well. It is said to contain no less than 76 grs. per gallon of various chlorides, &c., and is to some constitutions a mild aperient. The evil may probably be temporary, and exhaust itself in time, as it has of late diminished.——The Roman Catholic chapel of St. Marie, at Rugby, was consecrated last week. The founder is a Pro-

testant relative of the Shrewsbury family. The style is the decorated Gothic: it was designed by Mr. Pugin. The stained-glass windows, and the chancel fittings, were put up by Mr. John Hardman, of Birmingham, but there seems to have been no builder of the edifice itself, at least the trifling circumstance that it had a builder is quite overlooked by our authorities, more than one, who particularly note the presence of Mrs. Bennett, Lady Olivia Acheson, Mr. Bertram Talbot, *et hoc genus omne*.——The exterior of St. Paul's Church, Sheffield, says the *Iris*, has been much improved by the alterations lately effected by Mr. S. Brown, with the aid of patent spire-scaffolding.——The Phœnix Gas Company, says the *Birmingham Journal*, are having made, at Brierly-hill, an immense gasometer, which is to hold 671,498 cubic feet of gas. It will contain 28,000 feet of riveting, and will weigh 400 tons. Its mean diameter will be upwards of 150 feet, the circumference measuring 471 feet: depth 45 feet, of which 38 feet will be available.——A valuable mass of red-iron ore, with an excellent yield of iron, has been discovered at Llanharry, near Cowbridge.——The bricklayers of Chester have struck for an advance of wages, from 22*s.* to 27*s.* a week.——The 'mysterious machine,' for some time in course of preparation at Liverpool, has still a local habitation and a name, at least, if only half a reality. A witness 'attempts' to describe it, as well as he can, but he admits that he can make neither head nor tail of it. It is tubular, 120 feet long and 36 feet in girth at the broadest part, which is at one end of it,—whether head or tail deponent knoweth not. It is built of pine plank, air-tight, and free of knots. The entrance-door is at one side, and he talks of ante-room and public saloon, a winding staircase to 'a good look-out' in the roof, &c. &c., all in the belly of what appears to be so 'very like a whale' or a Trojan horse. It will take two years more to finish it in the 'superior style' in which it is being fitted up for at least 100 'passengers;' but whether through the heaven above, the earth beneath, or the waters under the earth is a mystery as yet profound as chaos itself. May not this ingenious conundrum be some new-fangled canal-boat, or a steamer for diving into smooth water under the stormy surface of the ocean, so as to insure smooth sailing—to the bottom at least—if not to insure the lives of those who are evidently expected to follow by the lot the special example of Jonah?——A new mode of paving the streets of Manchester has been substituted for the old mode of planting the broad Welsh hard sets, which led to the frequent fall of horses, while their mortar pointings were not a sufficient safeguard against the softening of the foundations. The sets are now placed 2 or 3 inches asunder, and the intervals are chocked with small gravel, through which asphalte is poured so as to render the whole impermeable to wet from above, and to afford a more firm footing for horses.——On Monday week the foundation-stone of St. Michael's Church, Mytholmroyd, Halifax, was laid. The merits of both architect and builder seem to have been completely outshone by the silver trowel and the hand that wielded it, for although both were present, neither are named in the usual chronicle of the event. The cost will be 2,500*l.*, site and investment fund inclusive.——The foundation-stone of the Lincoln Exchange was laid on Wednesday week.——The design is by Mr. W. A. Nicholson, and the scale is a spacious one, with accommodation for great public meetings, lectures, markets, &c. There will be a row of twenty-five double-fronted shops, with a covered market on one side, and a large open one on the other.——The Victoria Foundry, Dryport, Hull, lately finished, covers an area of about 3,000 square yards; and the machinery is capable of turning and casting twenty-five tons' weight of iron.——The Miners' strike in the west of Scotland still continues, and trade is almost at a stand-still by the withdrawal of wages.

Setting Saws.—An ingenious and inexpensive little instrument for setting saws has been patented by Mr. J. Tall, and will be found very useful. A remark in our pages some time ago, on the rudeness of the present method, led the inventor's attention to the subject.

SURVEYORS MADE IN FOURTEEN DAYS.

When the railway-projecting mania was at its height, and surveyors were being paid two, three, four, five,—any number of guineas a day, we cautioned the public against certain delusive advertisers professing to teach the art and mystery of surveying, levelling, mapping, &c. &c., in the short space of no time, or something equivalent thereto, and have reason to know that we saved the money and time of some few of our readers.

The same game, it seems, is still played, and not unsuccessfully. Last week a number of young men sought the aid of the magistrate at Worship-street against a deceptive promiser, who had set forth, in an advertisement headed "Railway Employment," that perfect practical instruction in surveying, levelling, mapping, &c., would be afforded, and employment guaranteed, at a liberal weekly salary, on a line of railway now on hand in Middlesex, and that the occasion presented a rare opportunity to persons wishing for a thorough knowledge of such occupation. Numbers of young men made their way to town from all parts of the kingdom, one even from Holland, and, on applying at the address given, Shepperton Cottages, Islington, were introduced to the writer of the advertisement, who represented himself as the surveyor to the West London extension line of railway from Willesden to Finchley (a little inquiry would have told them there was no such line), and who undertook for a fee of three guineas each to perfect them in the business in *about fourteen days*, and afterwards secure for them constant employment at a salary of two guineas per week, upon payment of a further premium of five guineas, to be deducted from their wages. The introductory fee was accordingly paid, and formal agreements were entered into by the respective parties; but beyond this, as might have been expected, they never reached. Great distress had been the consequence to some of the applicants, but the magistrate was unable to aid them: it was even doubtful if they could successfully take criminal proceedings against the advertiser for obtaining money under false pretences.

It may be laid down as an axiom, that the man who professes to make a surveyor in fourteen days, is not to be trusted any farther than he can be seen. Reiteration of this fact may save many from mortification and loss.

RAILWAY JOTTINGS.

A general suspension of railway works has been advocated by circular, and a metropolitan meeting of delegates from the directorial boards of the various leading companies has been proposed by the committee of the Liverpool Stock Exchange. This step, says the *Times* city article, has been adopted in consequence of 'the enormous sums which the railway companies are still attempting simultaneously to raise from their proprietors and the public.' But the dissection of so enormous a growth, though it may be as easily effected as may any enormous tumour be cut off by the rashest of surgeons, would probably lead to abnormal consequences of an equally dangerous description to the body politic, but which a skilful and gradual *discussion* of the mass by the sanative treatment of the physician would completely obviate. That this is a matter more lightly and easily plunged into and probed than prudently disposed of, we may have some slight idea, from the result of the recent cessation of operations on even a single line, the Edinburgh and Northern, in suddenly diffusing an abnormal mass over the face of the country, but too likely, even of itself alone, to be resolved, ere it can be properly absorbed, into a potent and irritant virus of social corruption. By that one consummation, 5,486 labourers, 766 masons, 384 carters, 224 miners, 160 joiners, and 116 smiths have been at once thrown destitute—a sum total of 7,366 *families* being thereby at once deprived of all honest means of earning a livelihood. Yet that is comparatively a necessary and inevitable evil. But it only shews, in connection with the sagacious project just noticed, how true it is that thousands and tens of thousands may be easily and rapidly slain by the jawbone of an ass. Is it not infinitely better that bonuses and dividends and per centages, be temporarily diminished, than that human life and morals by wholesale be permanently destroyed?——Enormous sums have been expended in the formation of many British lines compared with continental. In the construction of works and stations, the heaviest item of course, the expenditure per mile of the South Western has been 18,450*l.*, that of the Birmingham, 38,280*l.*, that of the Great Western 40,000*l.*; and that of the Manchester and Leeds, 41,400*l.* while the Belgian cost only 10,600*l.*, and even the Paris and Rouen but 17,000*l.* The Newcastle and Carlisle was on a par in this respect with the average of continental lines, viz., 12,000*l.* For these, even the lowest of them magnificent outlays, there is something to shew; but that cannot be said of the enormous sums swallowed up in law and Parliamentary expenses,—witness the London and Brighton, 3,000*l.* per mile for mere Parliamentary expenses, though that is by no means the worst instance of pure waste of money that might be adduced. These expenses alone, however, in this case almost equal the average paid for all the land and compensation paid for on other lines.——By the way, the London and Brighton seem to be improving on the ingenious system of discouragement to cheap class passengers, alluded to in our last jottings, by the introduction of a system of terrorism as well as of pain and disgust, already quite sufficiently exposed to be now without excuse, as a palpable system of cheap class discouragement. It is evident, says a leader in *The Times*, based on the complaint of another correspondent, that these authorities have even 'left their second-class passengers exposed to the risk of being shut up in a close carriage with a madman,' under 'alarming as well as distressing' circumstances, for which the directors 'owe some explanation to the public.' Explanation! We can readily conceive the only virtual, if not actual reply to a demand of explanation.—You can take a first-class carriage,—that is not a lunatic asylum,—there alone you will be safe, and in the right box,—as we will. What they most desire probably is this very advertisement of their inferior class preventitive, which has now been accomplished to their hearts' content, and as unequivocally as if it had, in plain terms, been—'Beware of man-traps and spring-guns in *low* class carriages!'——The Eastern Counties Company may soon perhaps have the merit of reviving and establishing those common road locomotives that were at one time looked on as destined successors and extinguishers of the rail. It has been seriously proposed by a Mr. Bates, in consequence of the late unwarrantable rise of fares on the Eastern Counties line, to establish forthwith, a locomotive stage coach company with steam-coaches of an almost perfected order, which he proposes to place at their service, under the complete conviction, that 'they will run the Railway Company off its own line.' Perhaps it may be the prospect of such a consummation that has lately led to the determination of the directors to reduce their establishment at the cross road near their Kelvedon station, where there is a perpetual traffic on the cross road night and day through the company's gates, which gates the directors now design to place under the guardianship of some one wonderful *Janus*, who is to have one eye on the rail and another on the cross road without intermission, or rather with his one look out open, while the other is shut, *et vice versâ*. The trains at least run at such intervals, that as a Kelvedonite remarks "if even uninterrupted by the traffic on the cross-road, the largest period devoted to sleep *cannot* at any one time *exceed* one hour and a half,—but it is obvious that the man on duty must be *constantly* on the alert, the traffic on the cross-road being continual. That the reason why Janus had two fronts was, that he might *nod* both ways by turns while yet an ever-vigilant gate-keeper,—and that these wise men of the East have found this wondrous secret out, and mean to realize it at Kelvedon, we are now quite assured, by the flood of light which this view sheds upon a curious, and, as we erroneously imagined, a nonsensical old ejaculation of the ancient Romans, addressed to one of the phases of the twofold god, and still preserved in Latin dictionaries for the mystification of posterity.—'Jane! *Quae* tu dormias?' Janus, in short, was clearly two single gentlemen rolled into one—and the star of that *one* has arisen in the East. But the public need

have little fear of such fatal consequences as those which frequently hung on the hinges of the gates of ancient Janus, if his modern priesthood contemplate the probability of being overrun by the locomotive wheels of the new Juggernaut, by whom their sacrificial functions are about to be altogether superseded. Otherwise certainly their ears may some day soon be assailed by the ugly question, as to their 'inhuman regulations,' which the Kelvedonian has anticipated.——It is rumoured that Mr. R. Stephenson has relinquished his office of consulting engineer to the South-Eastern, and that Mr. Barlow, the acting-engineer, is to be his successor.——The viaduct of the Lambeth extension of the South-Western over the Westminster Bridge-road was begun on Thursday last. The extension to Waterloo-bridge will be completed by February next.——The time-table of the North-Western has grown into a cumbrous pamphlet, with an index to it!——The works of the Direct Northern terminus at the Fever Hospital, King's Cross, are in rapid progress.——The Birmingham and Gloucester, it is said, is to be relaid with much more durable rails, at an estimated expense of 200,000*l*.——The Caledonian line was opened, according to previous notice, on the day announced. Having on several occasions noticed the progress of the various works on this line, it is the less necessary now to give any detailed account of them. We may cursorily notice a few of the more prominent, however, and first of the general station at Carlisle. The design for this structure, produced by Mr. Tite, was carried out by Mr. Hemberow, for the contractors, and Mr. Green, for the company. It is a joint station, as already observed. The front elevation is at present obscured by other buildings, and it is still incomplete; but, according to the *Carlisle Journal*, it will form an architectural ornament to the town. The Caldew viaduct, near Carlisle, is 360 feet long. Then follows the Eden viaduct of seven iron girder arches of 41 feet span, each resting on piers of the red sandstone of which Carlisle may be said to be built, and which the journal takes care to intimate is *not* constructed on the principle adopted in the formation of the bridge across the river on which the "jolly miller" lived, inasmuch as the Eden girders are arched on narrow spans resting on solid abutments of immense strength. A few miles onwards the Glasgow road is being carried over an oblique bridge, built at an angle of forty-five degrees. Here the foundation, already bordering on the Morass, is so elastic as to be felt in the trains. The Mossband Morass embankment site is celebrated both in a military point of view and on account of its movement over the whole of a fertile plain, which it buried in utter desolation. This is the dangerous ground alluded to in our last Jottings. The line runs close by the celebrated Gretna, where there is of course a *station*. Here, too, the Glasgow, Dumfries, and Carlisle line meets the Caledonian. A little further on is a cutting of 150,000 cubic yards of hard stony clay. Passing the vicinities of Langholm and Kirkpatrick, the latter thirteen miles from Carlisle, Ecclefechan is reached, where there is a viaduct of eight arches of 30 feet span each. Beyond this is a cutting of mixed gravel and limestone, 217,000 cubic yards in extent, with a bridge 115 feet long over it. At Lockerby, twenty-six miles from Carlisle, a 'handsome station' is in course of erection. About thirty-two miles from Carlisle there is an oblique bridge with iron girders. Annan water is crossed by a viaduct 350 feet long, with a timber top and stone piers. Beatock station is another 'handsome structure.'——In the city cars of the Harlem Railway, says the *New York Standard*, the coloured people are not permitted to ride any where except upon the *platform*. Their sixpences will entitle them to ride standing, but not to sit down by the side of the "up-town" snobs and flunkies, who

> "Forget the dunghill where they grew,
> And think themselves the Lord knows who."

—— Mr. Macdonald Stephenson was to leave England the other day with an engineering staff for India, where a line of railway is to be forthwith laid out and formed above and below Mirzapore. Mr. Brees and Mr. Adams were to accompany him as managing commissioners.—— A writer in the *Mechanics' Magazine* suggests the electro-telegraphic connection of all the pulpits throughout the country, and the simultaneous dispatch of a sermon from head quarters to a reader in each. We have heard of a machine like a barrel organ for grinding off prayers by the yard; if the one of these inventions were added as a complement to the other, we should certainly have nearly all that mortal man could do to *reduce* the gospel to a mechanical *system*,—but whether second-hand exhortations and mechanical orisons like these would promote the earnest and all-important truths of the gospel, is another question.

BURIAL IN TOWNS.

Crowds flocked to the meeting which was held on Wednesday night in the Crown and Anchor Tavern, Strand, to petition Parliament to abolish burials in towns, and were forced to adjourn from a smaller to the larger room. Mr. B. B. Cabbell, M.P., who presided, introduced the business, justly observing, it was most surprising that in a city so advanced in civilization, and remarkable for Christian feelings, such a practice should have continued so long. The evil arising from it pressed with greatest weight upon the poor, and therefore was deserving of the public sympathy. They must have been astonished, too, that when so much had been said about sanatory improvement, this subject should have been either passed over or regarded as one of secondary and minor importance. To obviate this neglect, they should take measures to bring it under the consideration of the Commission, recently appointed, to inquire "What means may be requisite for the improvement of the health of the metropolis?" He had no doubt that the interest which the public took in this matter, as evidenced by that numerous meeting, would have due weight with that commission. He then eulogized Mr. Walker for his efforts in this matter, and called on him to move the first resolution.

Mr. Walker addressed the meeting at considerable length, and detailed a number of startling facts. The effect of graveyards in producing illness was now too well known to need proof. Every adult breathed 28,000 times in twenty-four hours. It was, therefore, of paramount importance that the atmosphere should be uncontaminated. At Minchin Hampton, the earth of a graveyard had been used as a manure. The consequence was, that the rector's wife, daughter, and gardener, died of typhus fever. There were fourteen others who fell victims to the same disease, and two hundred children were attacked with measles and scarlet fever. It was a matter of enormous consequence for them to know that if the surface of the earth was corrupt, they could not have pure air. In the town in which these results took place, in fourteen years previous to the use of this graveyard earth, there had been scarcely a case of fever; but afterwards fever spread in all directions. Another case occurred at Axminster, where similar earth had been used as manure. In that town six or seven deaths had occurred of fever, and Mr. Hamon, a surgeon resident in the town, had informed him that scarcely a house had escaped its effects. He concluded by moving a resolution condemnatory of the practice.

Mr. C. Shaw, in seconding it, said, it was clear that the impregnation of the earth with deleterious and deadly gases must pollute the air, and that the inhalation of this polluted atmosphere must generate disease. This was a question which affected both rich and poor, but especially the latter. The rich could remove themselves from the infected circle, but the poor had no such means. They were compelled to remain in the vicinity of their work; they could not afford the expense of removal, and the deadly effects of this system, therefore, chiefly shewed themselves on that class.

Mr. Healey, in the course of a long address, said, there were 400 burying places in the metropolis, and they might be justly termed 400 places of conspiracy against the health of the public. They had heard that night of Enon and Elim chapel, the last being a contraction of the word Elohim. These were associated with holy things and holy ideas, but the desecration of the dead, which they now heard of in connection with these names, was calculated to bring holy things into contempt by associating them with a subterranean manufactory of death, contrived for the generation of deadly gases for those above them to inhale.

Sir C. Aldis, Mr. Stevens, Mr. Richard Taylor and others then proposed various resolutions, including a petition to the house, and a strong vote of thanks to Mr. Walker, and the meeting separated.

BLIND BUILDERS.

TENDERS FOR SEWERS.

The following tenders received at a special meeting of the Commissioners of Sewers for the Tower Hamlets, on the 8th inst., must "make the judicious grieve."

For extending the sewer in Cambridge-road, and Three Colt-lane, Bethnal-green, being a length of 1,050 feet. The tenders were as follow:—

Scissons and Co.	£820
Williams	810
Munday	736
Stuart	732
Shalders	715
Yeoman	705
Johnstone	657
Livermore	645
Coltsworth	635
Crook	619
Hill (accepted)	595

For arching over 850 feet of sewer at the back of Stepney-green:—

Williams	£460
Scissons and Co.	420
Munday	297
Yeoman	285
Johnstone	282
Coltsworth	282
Stuart	256
Hill	252
Livermore (accepted)	225

For arching over the sewer at the back of Selby-street and Pelham-street, Mile-end New-town, being a length of 2,048 feet:—

Crook	£1097
Munday	795
Johnstone	748
Coltsworth	697
Williams	690
Scissons and Co.	670
Stuart	650
Livermore	636
Hill (accepted)	594

The following tenders, for certain parochial works in Hampstead, are worthy to keep company with the above:—

Turner	£60	0
Johnson and Son	58	18
Stone	44	0
Miller	42	0
Poxon	38	0
Clowser (accepted)	19	15

WESTMINSTER COURT OF SEWERS.

A general court of sewers for Westminster was held on Friday, Capt. George Bague in the chair. Letters were read from several persons in the parishes of Chelsea and St. Giles, Bloomsbury, complaining of the bad state of the drainage. A long memorial was read, signed by the whole of the physicians and surgeons of the district, complaining of the frightful state of the part of Kensington known by the name of the Potteries, from the impure state of the drainage, rendering the atmosphere deleterious, and producing fever, miasma, &c. The memorial was referred to the surveyor, and at the same time a resolution was adopted, "That in consequence of the great pressure in the surveyor's department, consequent upon the increased powers under the new Act, the surveyor be empowered to employ such assistance as may be deemed necessary."

The proposed new Sewers in Kensington.—The court this day received tenders for the execution of works for the sanatory improvement of Kensington. They were as follow:—

For 550 feet of sewer in amended line of Gloucester-road, Kensington:—

Perkins	£339	0
Scissons and Co.	310	0
Dethick	310	0
Yeomans	295	0
W. Weston	288	15
Humphreys and Thirst	280	0
J. & S. Williams (accepted)	270	0

For 2,267 feet of 4½ sewer in Church-street,

Holland-street, Duke's-court, Church-court, and George-court, Kensington:—

Scissons & Co.....	£924	0
W. Weston	896	10
Dethick	877	0
Humphreys and Thirst ..	873	0
J. & S. Williams.....	845	0
Yeomans (accepted)	797	0

The next business was to consider as to covering over 300 feet of sewer, adjoining northward to Grosvenor-bridge, King's-road, Chelsea, recommended by the committee on view of the Ranelagh sewer. A long discussion ensued upon this subject, and on the chairman giving some explanation as to how matters stood in the district, Mr. Farlar interrupted him, and said the hon. chairman was completely misleading the court. The chairman repelled the observation of Mr. Farlar, that he was influenced by a desire to mislead the court, but on the contrary, to afford all the information that lay in his power; and the resolution being put, was carried by a majority of 9 to 5.

A deputation of the inhabitants of Wells-street, Marylebone, attended the court, for the purpose of ascertaining whether parties residing there, already possessing drainage for their houses, will be at liberty to enter the new sewer constructing in that street free of expense. The question led to a short conversation, which was terminated by the following resolution being adopted:—"That the parties in Wells-street who previously had drainage, be allowed to enter the new sewer free of expense."

The Powers of the Commission under the New Act.—The chairman read the following notice, which appeared on the business-paper of the day:—"To consider as to the parties to whom notices should be served, under the 10th & 11th Vict., c. 70, who are in possession or occupation of property fronting upon lines of sewers built at the charge of the respective districts."

The above notice was given for the purpose of putting into operation the powers of the new Act, by compelling parties to enter the sewers, and charging the owners of property in the different districts of this commission with the expense, according to the respective value of their frontages, as in many instances, although their property has been considerably benefitted, they have refused to contribute any thing whatever to the expense. Mr. W. Unwin proposed that they should commence with the eastern division of their jurisdiction, as being the oldest, and as very extensive works had been executed there more than ten years ago. It was suggested that by serving the whole of the district with notices at the same time, it might lead to confusion, and whether it would be better at first to commence with two or three streets as a preliminary movement.

The Clerk remarked, that the three first standing in the rate book were Houghton-street, Vere-street, and Drury-lane, and that few payments had ever been made for works done in that locality. And after some conversation it was resolved—"That notices be sent to the parties owning houses in Vere-street, Houghton-street, and Drury-lane, to compel the parties who have no proper drainage, to enter the sewers fronting their premises."

New Draining Tile Machine.—This invention, says the *Hull Packet*, consists of clay being taken from the solid earth and put into the machine, where it is tempered or manufactured into draw or pipe tiles at one operation. From 1 to 20 pipes, or tiles, can be produced at a time, without the aid of manual labour, further than wheeling clay to the machine, which is worked by one horse; consequently, hand labour is superseded, and likewise all pipe tile making by hand machines, which have hitherto been brought before the public. Stony clay is of little importance to the machine, as all stones are crushed before the operation of forming the pipe or tile, which will be the means of using some clays that cannot, although of a good quality, be brought into use. Our townsman, Mr. William Hodson, who is the inventor, is already protected by patents, and working one of the largest tile establishments in the kingdom by machinery.

An Architect suffering for Conscience' sake.—M. Bonnal, the city architect of Toulouse, in order to justify the payment of a certain sum by the municipal council to the director of the theatres of that city, was required to give a certificate that repairs which had been made were of such a nature as to prevent dramatic representations. Knowing this to be untrue, he refused to assert it: three days afterwards, he was deprived of his appointment. The occurrence is said to have caused much excitement in Toulouse.

New Books.

Sketches, Graphic and Descriptive, of the Decorative Painting applied to English Architecture during the Middle Ages. By E. L. Blackburne, F.S.A., Architect. John Williams and Co., 140, Strand.

An illustrated work on the painted decorations of our ancient buildings has long been a *desideratum*,—the Institute offered a medal for the best essay on the subject some years ago, but failed to elicit a satisfactory production. The work before us promises to supply this want efficiently, so far as it goes, but to be complete, it should be extended beyond the four parts at present proposed as the limit. Two parts are already published, and deserve warm commendation. The illustrations, printed in gold and colours, are beautifully executed; and the letterpress gives evidence of much research and care. We quote the introductory portion of it:—

"Chromic or coloured embellishments in architecture have their origin in remote antiquity. The Egyptians painted their temples and habitations, as did several other of the primitive Eastern nations; and the practice descending, became common alike to the classical and mediæval ages.

In that of England, properly so distinguished, the subject more immediately of the present work, such or similar decorations occur very early. Among the Anglo-Saxons, 'Pictures of Saints,' with 'embroidered cloths,' used as hangings,—'pictas vestes,'—as they were called, and painted sculptures, ornamented the walls and altars of churches so early as the latter part of the seventh century, following a custom coevally and long antecedently exhibited throughout the adjacent continent.

At the commencement of the ninth, sanctioned by authority and example derived from this source, we find the introduction of such pictures or paintings the subject of express ecclesiastical injunction. By a Canon of the second Council of Calcuth, or Celicyth, in Northumberland, held A.D. 816, every bishop dedicating a church, is strictly required to see painted on the walls or altars thereof the figure or picture of its patron saint. As a relative illustration, it may be noted also that in a Saxon MS. of this age, quoted in Muratori Antiq., are contained (among others relating to similar arts) directions for staining glass, so as to form 'pictures of mosaic work,' with which it would seem many of the altars and shrines of this period, in imitation of the foreign glass and other mosaics similarly applied, were constructively and otherwise ornamented.

Of the extent of these and the like applications of painting and mosaic during this and the next succeeding century, little or no direct and authoritative record now exists, though indications of the adoption of such are to be traced in the descriptions of the altar Tabulæ, and other similar gifts, made to the early Saxon church. Approaching the Norman era, however, an extended use of 'picture work,' under which term both these forms of decoration were at this time included, is decidedly and distinctly established. 'Superb picture work,' intermixed with gold, is described as among the works performed by the Saxon Archbishop Aldred to his Cathedral of York in 1061, and the pictured ornaments of the Church of St. John, at Beverley, of a corresponding age, are also alluded to by the same authority. At a little later date, the second, or Lanfranc's Cathedral at Canterbury, had its ceiling 'egregiè depictum.' Subsequently, Malmesbury also notices its 'pictured roof,' and in continuation, the choir paintings at Ely, by Bishop Ridel, and the ceiling at Peterborough, may be adduced, which latter, erected according to general authority between the years 1177 and 1199, has descended (restored) to the present day.

From the period to which the above notices have reference, pictured or painted decorations of several kinds appear to have been commonly introduced, and are matters of frequent and particular account.

During the long reign of Henry III., occupying the whole of the first half of the thirteenth century, directions as to such are numerous and special, in connection with the various works ordered by this king to be performed at his several palaces and residences at Westminster, Northampton, Guildford, Winchester, and elsewhere.

In 1220, the fourth year of this reign, the king's painted chamber, 'cameram nostram depictam," in the Castle of Winchester, is referred to. In 1232, the sixteenth, the figures of the four Evangelists, with those of St. Edward and St. Edmund the king, are ordered to be painted in the Chapel of the Palace, at Woodstock. Again, in 1233, the following year, a mandatum, addressed to the Sheriff of Southampton, directs the king's wainscoted chamber 'cameram regis lambruscatam,' in the Castle of Winchester, to be re-painted with such 'histories and pictures as were previously depicted there;' and there are other further notices almost yearly throughout this reign.

In the following reigns of Edward I., Edward II., and Edward III., similar applications continue to be recorded in the descriptions of the decorations by these kings, to the Palace, the Chapel of St. Stephen, and the Abbey Church at Westminster, as well as in those referring to others performed by several of the higher ecclesiastics of this period to their palatial residences and churches. Early in the reign of Edward II., Bishop Walter Langton caused the coronation, marriages, wars, and funeral of his patron, the late king (Edward I.), to be painted on the walls of his Episcopal Hall at Lichfield, then newly built. About the same time also, Adam de Sodbury (Abbot) adorned the nave roof of Glastonbury with 'beautiful paintings;' and in 1335, 1336, and 1339, 'nova pictura' are mentioned among the works at Ely.

Henceforward it is hardly necessary to follow the order of further reference, or to recur to the numerous additional evidences that might be adduced of the continued and increasing admission of painting and colour during this and the fifteenth and sixteenth centuries. Many examples yet remain, and sufficiently exhibit both the universality of the practice throughout those periods, and its great beauty, discriminately applied, as an accessory enrichment in our ancient architecture."*

The first part contains the following illustrations:—Choir ceiling, Malvern Abbey Church; screen, Aldenham Church, Herts; tomb of Lord Bourchier, Westminster; wall-paintings, Westminster, Tewkesbury, &c.; lectern-stand, Littlebury.

The second part has six, namely,—Back of a niche, altar-screen, Lady Chapel, Gloucester; ceiling from the Deanery, Worcester; tomb, south aisle of the chancel, Maidstone; nave-ceiling, Great Malvern Church; tile pavement, Chertsey Abbey; and niche in the parvise, Harrow.

Correspondence.

PERPETUATION OF MIDDLE-ROW, HOLBORN.

Sir,—The proceedings at Middle-row, Holborn, where four houses have been pulled down in order *to rebuild them*, have produced the utmost astonishment amongst all classes of people, as well as the deepest feelings of regret. The question which you put is continually asked, "Can nothing be done to prevent the perpetuation of this great obstruction in so important a thoroughfare as Holborn?"

I really think that Government might undertake the purchase, on its own responsibility, certain that the House of Commons would not only grant indemnity, but thanks.

Where is the "Metropolis Improvement Commission?" Will nobody make an energetic remonstrance to Government against letting slip this favourable opportunity for abolishing such a nuisance as Middle-row Holborn?—I am, Sir, &c.

An Advocate of Convenient Thoroughfares.

A Hint from America to our Commissioners of Sewers.—An aqueduct was recently built in Boston, from Tremont-street to State, the distance of a long block, and the street repaved, all within seven days. The workmen laboured in gangs of 140, one going on at seven o'clock in the morning and another taking their place in the evening, working all night.—*New York Sun.*

* An interesting article on the early history of mural decorations by Mr. Waller, will be found in our fourth volume, p. 301.

Miscellanea.

PLAN FOR PROMOTING SANATORY REFORM.—The commission of sanatorial inquiry which has been issued, consisting of Mr. Edwin Chadwick, Lord Robert Grosvenor, Mr. Lambert Jones, Professor Owen, and Dr. Southwood Smith, will have much to do and will need assistance from without. With a view to affording this, the *Daily News* refers to Franklin's club of twelve in Philadelphia, and suggests a similar institution here and now. "It was never allowed to exceed that number, but each of its members was encouraged to form a club of twelve in his more immediate vicinity. The members of these, when their numbers were filled up, again formed other clubs of twelve. When any useful institution, any reform in the city institutions, occurred to a member of any of these clubs, he proposed it for discussion. By means of the members common to other clubs, it was discussed by all of them in rotation, and the result of the deliberations of each was communicated to the others. In a wonderful short time the public opinion of Philadelphia was thus ascertained or prepared for any reform simply by the enlightening it and the maturing the plan by repeated discussions. Might not similar clubs for discussing sanatory reform in a quiet friendly way be instituted throughout the metropolis? Men who shrink from publicity, and have a distaste for the exaggerations of agitating orators could make themselves useful in this way in preparing the minds of their personal friends; and the general body of sanatory reformers would thus be enabled, without tying themselves to any leader, or withdrawing themselves from their industrial pursuits and calm domestic pleasures to be ready to answer "yes" *en masse* when the authors of a metropolitan sanatory police bill worthy of their acceptance ask them whether they insist upon its being carried." Our article of last week served to usher in the new commission. Mr. Henry Austin, the honorary secretary of the Health of Towns' Association, has, very properly, been appointed secretary to the commission.

PAINTED TABLETS AND NOS.—A correspondent, Mr. "Henry Williams, citizen and letter-painter, London, 1846," has sent us a "copious and diffusive" MS. treatise on "Letter Painting," which, as he defines it, "is a grand improvement in one of the departments of British Art, invented by a writer and decorative painter in the commencement of the year 1846. Its participant is the application of silica oil colours, from the very first process of the groundwork, or foundation, to the entire and final completion of the inscription thus depicted, which in appearance is on an equilibrium with enamel painting." If we understand all its definitions, axioms, corollaries, inferences, and conclusions, what this "writer and decorative painter" claims as his own invention is the application of the silica colours to the letter painting, but his meaning and object are so hidden under thick coats of 'much learning,' clearly not of silicate transparency, that even with the aid of his "vocabulary," or "concise nomenclature for the technicalities previously used," we can scarcely make it out. "The several departments in this new walk of art are imitation zinc-plate grounds with black letters, and white grounds with black letters, white grounds with coloured letters, and tinted grounds with letters of various hues." A specimen sent us, with a contrast in the ordinary manner, but of a darker ground tint, certainly exhibits the figures clearly and distinctly enough, but whether "it possesses a permanent character such as will tend eventually to benefit the shareholders of railway companies at large, if adopted for those species of inscriptions, viz., names, numbers, initals, &c., not of a temporary class," remains to be seen. The inventor's own opinion of these "inscription tablets" is, that "owing their origin to a grand discovery in British Art," they "are completed with extraordinary tact as to give great energy to this present enterprising and inventive crisis."

CAUTION TO BUILDERS.—The contractor or builder of the Peebles hustings is to be criminally tried for his imperfect carpentry. In the calender of the ensuing Jedburgh assize appears the name "Alexander Dickson, for culpable neglect of duty in constructing election hustings."

PROJECTED WORKS, &c.—Tenders have been called for by advertisement for the whole or part of the works required in the erection of a church near Kidderminster; for the building of a national school, with residence for master attached, at Maryport; the erection of a temporary wooden station at Leeds for the Leeds, Dewsbury, and Manchester Railway; the various works required to be done in the erection of the station buildings at Dewsbury on same line; the execution of various works at Broughty Ferry, near Dundee, on the Edinburgh and Northern Railway, consisting of wharf walls, piers, and low water landings, with excavations; a supply of flints, whinstone, Bombay and Guernsey granite, Rockhill paving-stone, and Aberdeen granite edge curb, &c., for the parish of St. George Martyr, Southwark; also, for excavating at a mill-dam at Portsea; for gasometers, pipes, syphons, branches, lamp-irons and posts, glass lamps, &c. &c. for the Newbury Improvement Commissioners, and for lighting with gas; also for gas-fitters' work, and smith and iron-founders' work at Leeds Industrial Training Schools.

BEGGING ARCHITECTS.—The current number of the *Moniteur des Architectes* gives a copy of an amusing letter addressed by an architect to various of the *porters* in Paris, suggesting that they should exert themselves to induce their employers to engage him as their architect, and promising them a good share of the fees. The letter ends nobly with "write me a line by the post, and I will come to you immediately." The editor, after commenting on such conduct with proper severity, says,—"When will it be permitted us to drive the money-changers from the temple?"

THE FALL OF HOUSES AT SOHO.—It appears that the two fallen houses in Dudley-court, Crown-street, which formed a portion of the range of condemned buildings in course of demolition, had been already in the hands of the destroyers, who had been engaged in withdrawing the interior wood-work, so that some trouble only was saved, and nothing lost, by their downfal, which happily took place without accident to human life.

THE GLASS TRADE.—A recent influx of new patterns, particularly in the cut-glass trade, has led at Stourbridge to a misunderstanding between the operatives and their employers as to prices. The men, however, are said to display an anxious desire to settle the matter in a friendly spirit, which we should think is likely eventually to satisfy all their reasonable expectations.

TOWER HAMLETS COMMISSION OF SEWERS.—At a meeting of the Commissioners, held on Wednesday last, it was resolved to apply to the Lord Chancellor for a new commission for the Tower Hamlets, the present commission expiring in December.

REMINGTON'S AERIAL BRIDGE.—Under this title a curiously slight timber bridge is being exhibited at the Surrey Zoological Gardens, and deserves a visit.

TO CORRESPONDENTS.

"*Cardiff Town Hall Competition.*"—A correspondent on this subject, p. 418 *ante*, said that a plan "was sent in openly" from the town surveyor of Cardiff "designed for quite another site." The surveyor in question wishes us to state, that his plan was not sent in competition, but as a distinct proposition.

"*C. J.*"—The quotation from Spenser's "Faerie Queene" relative to architectural proportions, will be found in Book II., Canto 9, Stanza 22.

"*W. P.*" (Islington).—The story in question, above the entablature, is called an attic.

"*J. P. B.*"—Our correspondent's remedy is against the contractors, who are bound to see him reimbursed.

Theta Beta.—An opinion on imperfect information would only mislead: take the advice of a local architect.

Received.—"J. M.," "W. N.," "J. G.," "J. K.," Mathematician."

Books Received.—"Plans and Elevations of Cottage Villas and Country Residences." By W. Pattisson, Architect. (Williams and Co., 140, Strand.) "An Introduction to the Present Practice of Surveying and Levelling." By a Civil Engineer. (Williams and Co.) "The Assistant Engineer's Railway Guide in Boring, Setting out Slopes, &c." By W. Davis Haskoll." (Williams and Co.) "Elements of Geometry: with a new Demonstration that the Sum of the Angles of a Plane Triangle is equal to Two Right Angles." By J. D. (Longman and Co.) 1847.

"*Books, Prices, and Addresses.*"—We have not time to point out books or find addresses.

ADVERTISEMENTS.

ARCHITECTURAL SUBJECTS (Outlines) coloured for competition or exhibition, and embellished with landscape, &c. Buildings, Portraits, and Views of every description, lithographed in a superior manner, by GEORGE CHILDS, 12, Amwell-street, Pentonville.

COMPETITION DRAWINGS.—TO ARCHITECTS, &c.

MR. THOMAS S. BOYS, Member of the New Society of Painters in Water Colours, and author of "The Picturesque Architecture of Paris, Ghent, Rouen, &c.," and of "London as it is," offers his services in Tinting Backgrounds, Landscapes, Perspective Views, Interiors, &c. From the long experience he has had in such subjects, he is fully aware of the points essentially necessary to be attended to. Drawings and designs lithographed in a superior manner.—Address, Mr. BOYS, 21, Great Titchfield street, Oxford-street.

PATENT BELLS.—Messrs. MEARS beg to call the attention of the trade and the public generally to these articles, which they are now prepared to supply in any quantity and variety. The composition is of a new metal, called the Union Metal, and the bells are of very beautiful tone and cheaper than those made of the ordinary bell-metal.—Orders received at the Bell Foundry, Whitechapel, for House, Cattle, Clock, and other Bells.

PATENT METALS for Bearings.—Engineers and all Manufacturers in Brass, &c., &c., are respectfully invited to test the quality of these new alloys, which have already received the sanction of eminent engineers and parties connected with public works. One sort for bearings and engineering purposes generally, will be found superior in quality and cheaper, than the metals now in use. Other sorts will be found of a better colour, a more brilliant surface and bearing a higher polish than any ordinary brass.—Messrs. MEARS will be happy to send any quantity as samples, or to make any castings from patterns sent to them.

WOOD and STONE.—Rough Blocks of STONE, of small dimensions, old CARVED STONE and old WOOD CARVINGS WANTED. If convenient to the first forty miles of the South-Western Railway, they would be preferred.—Particulars to be sent to A. B., Mr. HODGSON, 406, Strand, London.

WOOD PAVING.—The Directors of the Metropolitan Patent Wood Paving Company, are prepared to execute orders on the shortest notice, for Paving Railway Stations, Sheds, Wharfs, Yards, Porticos, School-rooms, Gateways, Forges, Workshops, Breweries, Stables, and Barns. Their system of Wood Paving is admirably adapted for the above purposes, and is much in use.—Office, Belgrave Works, Thames Bank, Pimlico.

PAVING, 2s. 9d. PER SQUARE YARD. Basements, Foot-walks, Malt-houses, Corn Stores, Floors of Warehouses, and every description of Pavement laid down at the above low price, and the work guaranteed.—Apply to JOHN PILKINGTON, POLONCEAU'S BITUMEN PAVEMENT OFFICE, 13, WHARF-ROAD, CITY-ROAD.—N.B. Country Agents and Railway Engineers and Contractors supplied with the best bitumen for covering bridges and arches.

CAEN SUFFERANCE WHARF, ROTHERHITHE.

LUARD and BEEDHAM beg to inform Architects, Surveyors, Builders, and others, that they have removed from Norway Wharf, Greenwich, the whole of their Caen Stone business, to the above extensive premises, where a large Stock will be kept up by continual fresh arrivals from their quarries at Allemange. Orders received at the wharf, and further particulars may be obtained of Mr. GEORGE GATES, 18, Southwark-square, Borough, London.

Orders shipped direct from Caen to any port.

The Waterman Steamboats call at Lavender-pier, adjoining Caen Wharf.

PIMLICO MARBLE AND STONE WORKS, BELGRAVE WHARF, PIMLICO-ROAD.

SAMUEL CUNDY begs to inform Architects and others, that GOTHIC WINDOWS, and every other branch of Stone-work, &c., are executed at the cheapest possible rate, and packed for the country ready for fixing or fixed, enabling ARCHITECTS to have the most difficult TRACERY for CHURCHES, or other buildings in the PROVINCES, executed under their immediate inspection in TOWN.

BUILDERS and MASONS can have every description of Stone in the London Market, either in the rough block, or cut to sizes from the saw, or prepared ready for fixing or fixed, avoiding either waste in the goods or carriage.

Box Chimney-pieces from 12s. upwards.

THE WORCESTER ENCAUSTIC TILES, in all their beautiful variety, may be inspected, in addition to the usual extensive stock of Chimney-pieces and FONTS.

Estimates given for building generally.

ANSTON QUARRIES.—Messrs. WM. WRIGHT and Co. beg to inform Architects, Engineers, Builders, Stone Merchants, and others, that they have opened QUARRIES in the land adjoining those of Messrs. Grissell and Peto, and are ready to supply any quantity of stone on the shortest notice.

This VALUABLE STONE, so celebrated for its durability, colour, and texture, is well known, having been selected (in preference to all other in England, by the Commissioners of Woods and Forests) for building the New Houses of Parliament. Facilities are at hand for forwarding the Stone to any part of the kingdom.

Application to be made to Messrs. Wm. WRIGHT and Co., Anston, near Sheffield, Nottinghamshire.

MAGNUS'S ENAMELLED SLATE.—Under the patronage of Her Majesty, Prince Albert, the Duke of Wellington, and the principal of the Nobility, the most eminent Architects, Builders, &c. &c.—This beautiful material has been introduced into Buckingham Palace, the drawing-rooms at Osborne, Apsley House, Strathfieldsaye, &c. &c., and it is now taking the place of marble in the mansions of the nobility generally. It is also extensively used in Government offices, the principal railway stations, and other public buildings. It can only be distinguished from real marble by its superior brilliancy of polish, and it is more durable, and less liable to chip at the edges, than marble. The choicer productions, such as black and gold, sienna, jasper, verd antique, jet black, &c. are not more than one-third of the price of marble. Among the articles manufactured at the Pimlico Slate Works are chimney-pieces, consoles, billiard and table tops of all descriptions, pedestals, pilasters, columns, plinths, tazzas, mural tablets, baths, wash-stand tops, &c. &c. Cisterns, dairy shelves, flooring and plain slate work in general executed on exceedingly moderate terms. Welsh slate slabs, of the finest description, at very reduced prices.—N.B. The trade supplied with whole cargoes, self-faced, or planed on one or both sides, direct from the quarries.—A book of prices will be forwarded on application to Mr. MAGNUS, Pimlico Slate Works, Upper Belgrave-place, London.

By Her Majesty's Royal Letters Patent.

BAILLIE'S PATENT ROUNDED RIM LOCKS, WITH SECRET AND SECURE FIXINGS.

THIS CHEAP and USEFUL ARTICLE, obviating the unsightly appearance and insecurity of the common rim lock, can be obtained from the Manufacturers, Messrs. CARPENTER and TILDESLEY, Willenhall; or from the sole Agent, Mr. JOHN FAULKNER, Ironmonger, &c. St. Martin's-le-Grand, London, opposite the new Money Order Office.

PRO BONO PUBLICO.

CAUTION. To Purchasers of Locks, fire-proof Doors, Safes, &c. JOHN LEADBEATER, many years manufacturer for Chubb. LEADBEATER begs most respectfully to inform Architects, Surveyors, Builders, &c. that he can supply them IMPROVED DETECTOR LOCKS for universal purposes, STRONG WROUGHT-IRON FIRE-PROOF DOORS, SAFES, and CHESTS, &c. on the most improved principles of security against FIRE and THIEVES (without the aid of "expensive machinery," which is employed by some inexperienced makers, but must be paid for), at prices 25 per cent. under any other house in London.

LEADBEATER offers ONE HUNDRED POUNDS reward to any person who can pick his improved detector locks or latches. Some thousands of Leadbeater's strong-room doors and safes have now been put up without a SINGLE COMPLAINT, and fifteen years' practical experience, during which he has adapted every possible improvement to real security, enables him to challenge competition with any other house in London. A large assortment on sale and made to order. A pair of extra strong wrought-iron fire-proof folding doors with ventilating gates, well adapted for a banker's strong room, may be viewed at his manufactory. Strong wrought-iron doors for party walls, with wrought-iron rabbeted frames, and secured by the BEST DETECTOR LOCKS IN ENGLAND, 6 feet high by 2 feet 2 inches wide and upwards, price £10 each, always on hand at LEADBEATER'S MANUFACTORY, 128, ALDERSGATE-STREET, LONDON.